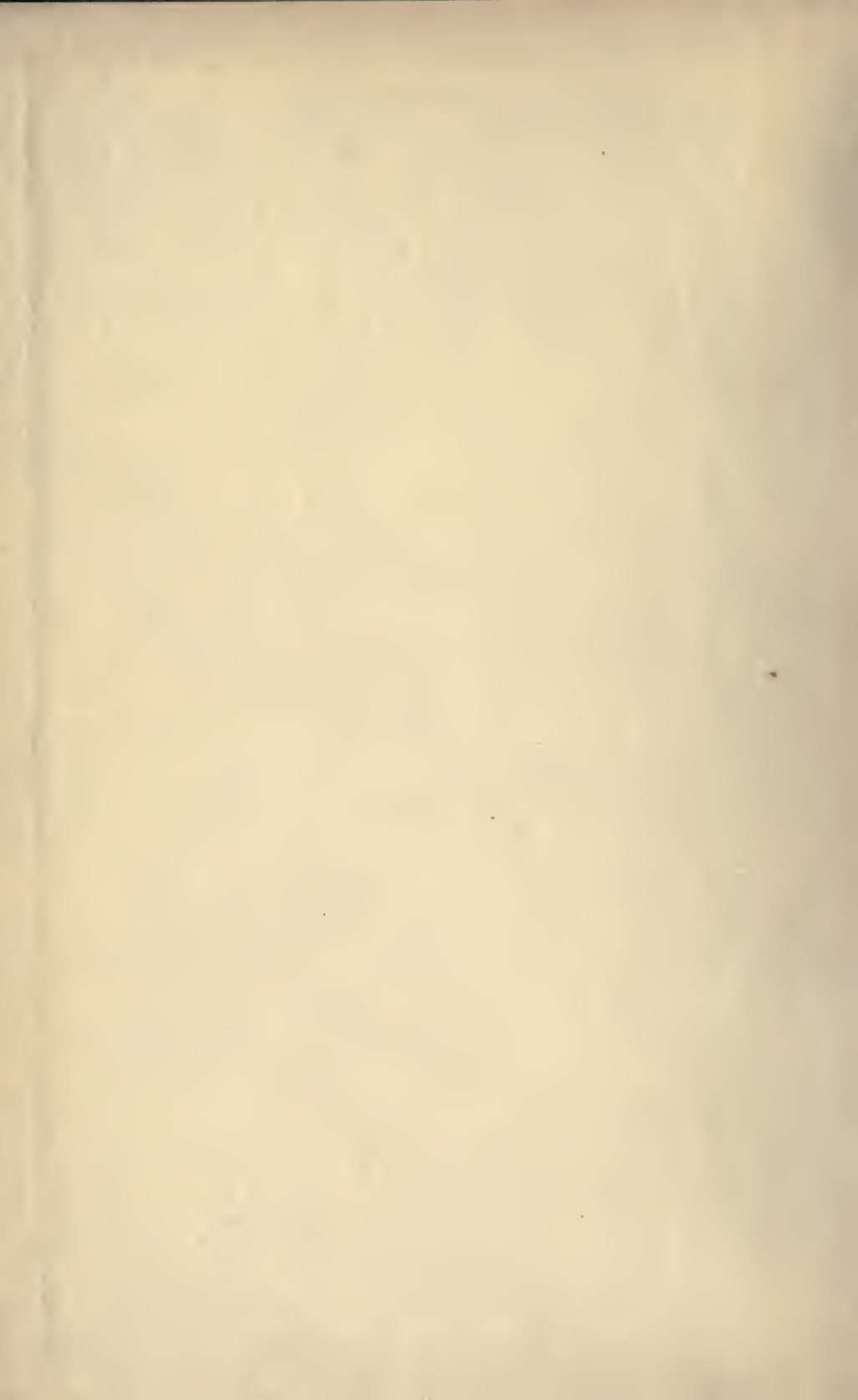


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THE NEW PHILOSOPHY

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A QUARTERLY MAGAZINE
DEVOTED TO THE INTERESTS OF
THE SWEDENBORG SCIENTIFIC ASSOCIATION



VOLUME XII
1909



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12/2/13.

THE SWEDENBORG SCIENTIFIC ASSOCIATION,
PHILADELPHIA,
1909



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(1898—1910)

BOUND IN VOL. XIII

(1910)

THE NEW PHILOSOPHY.

VOL. XII.

JANUARY, 1909.

No. I.

BEING AND EXISTENCE.

A PHILOSOPHICAL DISCUSSION.

BY FRANK SEWALL.

VII. LIFE AND LOVE.

Life is the only name we can give to Being when we regard it as self moving, as self created, simply; but when we regard it as the primal end, the first cause of finite being, the creator of the created, then we can give it only the name of this eternal motion, this eternal desire, this seeking the other than itself,—Love.

Swedenborg says that all men know that life is but they do not know *what* life is, namely, that it is love! Precisely as the Agnostics may say that “pure Being eternal and infinite is, but we do not know what it is;” or that “there is a universal life and a source of life to finite being but we do not know what that life is.” But let them consider what alone that life, that self-moved and moving substance must be, which can cause other things to be, or make Being to exist, or can account for there being things over against the original pure Being;—and they will see that no other name belongs to it but that of love. Science, as well as philosophy, seeks the First Mover inasmuch as the distinctive quality of matter or all created substance is its *vis inertiae* or its inability to move itself.

Matter might almost be defined as that order of being which is incapable of self-motion and can only be moved. But by this definition we would by no means imply that matter is not everywhere in motion. Rather we would say with modern science that matter everywhere exhibits motion the more in-

teriorly it is examined; so that the searcher after the original atom is almost brought, with the late Lord Kelvin in one stage of his inquiry, to define matter in its primitive state as a form of motion in a frictionless space, a definition recalling Swedenborg's term—"a mode of motion in the infinite." Since motion exists and matter cannot originate it, its origin must be sought in a cause which is before or above matter. There is a common agreement to call this moving cause a force; but *this* force must be self originating; and there is no conceivable self-originating force but that of volition—the will acting. The will acting is what Swedenborg calls love and this he names the real substance, the real life, the real first Mover, before which nothing was and without which nothing could have come into existence.

I have said that pure *Esse* when qualified exists or stands forth with qualities; and that pure Being now stands forth or exists in the quality of love, love as the prime substance, force, motion of all things and therefore as the life. It would seem as if love were therefore an attribute or a quality of being rather than the being, the first substance itself. This has been a common conception with philosophers and theologians heretofore. Notwithstanding the Scriptural declaration that "God is love," the theologians have clung to an idea that God is a Being that loves but that nevertheless has a kind of fundamental being apart from and independent of the love. In the same way instead of holding that God is life they have conceived of God as substance having life as an attribute. Directly contrary is the conception of the new philosophy that the first substance—the *Esse* as existing—is love itself, is life itself. If these are qualities or attributes of pure being take them away and there is no being left. There was never infinite Being that was not living being; there was never infinite Being that was not loving Being. The love and the life are in reality identical with the Being although in our minds and in our speech we may treat of Being as abstracted from both. Swedenborg, thus in T. C. R., No. 36, distinguishes between the *Esse* of God and his Essence. "We have made a

distinction between the esse of God and his essence by reason of the distinction between the Infinity of God and his love; infinity being a term applicable to the esse of God and love to his essence; for the esse of God is more universal than his essence and the infinity of God is more universal than his love; therefore we add the adjective or term 'infinite' to the essentials or attributes of God which are called 'infinite'—as we say of the Divine Love that 'it is infinite,' *not that the esse of God is pre-existent to his essence but because it enters into the essence as something adjoined, cohering with, determining, forming, and at the same time exalting it.*" non quod Esse Dei præexistat, sed quia ingreditur. Essentiam ut adjunctivum cohærens, determinans, formans et simul elevans.

From which we learn that the infinite is more universal than the essence love, only in the sense that the adjective as a term is more universal than the substantive classified by it. Red is a more universal term than flower and yet we define or limit flower when we say a red flower. The term red "determines" and so forms the substantive flower. So infinite, a term applicable to the esse of God, determines and forms or gives universality to love as the essence of God. But love we see to be that substance which is infinite.

The effort to get behind the idea of love as the first substance is like that to arrive at some thing prior to life itself, prior to force, prior to volition or that which alone moves itself. The scientists have stopped at Force as the ultimate conception of the all-originating source. When they say—Give us "Force and Matter" it is evident they mean—Give us the "mover and the things moved"—and we have the Universe. "L'atom et la Force—Voilà l'univers;" (Saigey in *La Physique Moderne*). In resolving the atom to its elementary substance there is no limit to its conceivable divisibility so that there is no appreciable fixed bulk of stuff constituting the ground of matter. We use the atomic symbol to express such but we cannot reach it in fact. The ultimate source of matter would seem to resolve itself into the mathematical point, or that which according to its definition has neither length, breadth nor

thickness, but which by *its motion* evolves or creates the line, the line by revolution the surface, the surface by revolution the sphere, etc. Thus the origin of the conception of space-filling matter seems to be found in force or that which produces motion. There is but one self-originating force conceivable, namely, that of volition. Hence it seems a clearly scientific deduction that love as the originating volition is the primary substance. The moving force of love as the prime substance is instinctively admitted in the phrases which speak of man's acting from, or being "impelled," by this or that "*motive*;" meaning an action of the *will*; as also by our naming these love- or volition-beats, "emotions" and "impulses." That which moves and sets in motion is love, and love is life; and as the life must precede in our conception the thing that is animated or made to live, and as the mover must precede the moved, so life and love must be conceived of as prior to those fixed, dead and in themselves motionless forms which we call the material substances. Our idea of substance, drawn from matter is of something solid, inert, impenetrable, lifeless; but this is clearly rather the form or the appearance of substance to our senses than the very prime substance which as we have seen must be action itself and life itself. So Swedenborg speaks of fire as the primary substance in a state of the most intense activity—and the scientists have come to speak of *heat*, *force* and *mode of motion* as equivalent terms. And the idea of love, the counterpart of heat in the spiritual order, as the fitting all embracing name for this only all originating motive-force is not a transcendental or figurative one, but one demanded by the exactness of science.

VIII. LOVE IS SUBSTANCE.

We have now to notice that what we sensuously and objectively know of substance in matter is not the pure substance itself but the form of substance, and that of substance itself we have a conscious perception, or feeling, namely, that it is life. It is a part of the inverted order of our human knowledge as finite—and so of our human science, that we

should think we know what we do not know and that we should deny or call unknowable that which we are more sure of than anything else. Thus the scientists say, we know what matter is because our senses tell us, and it is therefore the only knowable substance; whereas the truth is, the *substance* of matter does not appeal to the senses at all, we neither can feel it, taste it, measure it nor weigh it. What our senses have to do with is the appearances, or the forms which this ever living, ever moving substance assumes to them. Thus it is *form*, and form only, that we know in matter or have a *scientia* of, and the science of matter is not a knowledge of substances at all but of the forms and appearances of substances.

On the other hand, the agnostic scientist says, "of that which is beyond the veil of phenomena, or beyond the testimony of our senses we know nothing; we acknowledge that something is there but what that something is we know not." And yet in a true sense—that something beyond is the only thing that all men, Agnostics as well as others, do know and know most intimately, and that is life. If there is anything that every human being knows really,—by conscious perception of it, that is, instead of by mere learned definitions of it,—it is life. And this is the fundamental knowledge because it is the knowledge of the substance itself. Out of this grow and on this rest all other knowledges and all proofs and certainties. The scientific or sensuous knowledge is but a knowledge of the forms of this substance or of the phenomena of this life. Descartes deduced his first certainty "*I am*" from the consciousness of his thinking—*cogito ergo sum*. He did not derive his being from his thinking but his certainty of his being; and a strictly true statement of what he meant would be;—*I think; therefore I am certain that I am*. But he might have said with perfect accuracy, "I love; therefore I am," for his loving was his very life or being itself.

We see therefore that knowledge applies to the form of things just as feeling or perception does to their substance. We feel *that* a thing is; we know *what* it is; we feel or perceive its substance; we know its form. Our perception of the sub-

stance of sensible objects is indeed an inferred knowledge rather than a direct one. We cannot say that we feel or perceive the substance of an orange; all that we know is the forms by which that substance appeals to our various senses, thus as round, yellow, sweet, etc. But because our primary knowledge is composed of a perception of our own life as THE SUBSTANCE to which all sensuous knowledge subserves as FORM, therefore we infer that within all forms which we know there must be equally a substance.

In other words, our first immediate knowledge of ourselves in consciousness tells us that life presents itself to ourself as something to be known; and that that presentation of life to knowledge is by life's assuming some form to our sense, at least, if not to our thinking. Thus our first knowledge is that substance has form—and our first and universal and abiding inference is that all forms are forms of an actual or a possible substance. Hence our belief in the phenomenal world.

(*To be continued.*)

ERRATA.

In October *New Philosophy*, p. 136, line 10 from bottom, read "*with* end and cause" instead of "as end with cause," and follow this with (;); in line 7 from bottom, place comma after eternity and continue the sentence. On p. 138, at end of line 8 from top, insert "possible."

REPORTS.

REPORT OF MR. A. H. STROH.

Rev. Frank Sewall, M. A., D. D., President of the Swedenborg Scientific Association:

In a report to the Association, dated May 11th, an account was given of the work on Swedenborgiana in progress here. At the time of writing several plans were on the point of being executed which have since then been duly carried out, and in so successful a manner as far to exceed the expectations of those who had closely observed the development of interest in Swedenborg and his works. I shall now proceed to give some account of the events referred to, as well as of a visit to England and related matters.

THE DEPOSITION OF SWEDENBORG'S REMAINS IN THE CATHEDRAL OF UPSALA.

In two open letters addressed to you, for publication in America, on the reception of Swedenborg's remains at Carlskrona and Upsala, I gave a brief account of the memorable proceedings which have caused such a popular revival of interest in Swedenborg's personality and works. It is a noble quality in a nation, and in humanity, the honoring of the great dead. Youth and the multitude will not clearly distinguish between a great man's personality and the principles for which he stood, but nevertheless it is the mighty truth for which the hero fought which is really worshipped by those who worship the hero. The Swedish people recognized on May 11th the national proportions of Swedenborg's greatness and honored his memory by a solemn act, by depositing, with the most impressive ceremony, the remains of their illustrious compatriot beside those of Rudbeck and Linnaeus in the Cathedral of Upsala. When that grand old Reformation hymn, "A Mighty Fortress is our God," resounded through the vaulted arches of Upsala's venerated fane, it seemed as if the mighty spirit of the Swedish race, which in a fateful hour saved the Reforma-

tion and guarded the rebirth of freedom, awoke once more, stirred by the memory of the mighty dead!

The recital of particulars here would occupy too much space. In the June and July issues of the English *New Church Magazine* are printed two illustrated articles on the proceedings at Carlskrona and Upsala, and an illustrated memorial volume is in hand, to be published at London, by Dent & Co.

There were many beautiful wreaths in honor of Swedenborg, at Upsala on May 19th, and among them was one representing the Association, placed at the head of the casket, with the Red, White and Blue in three bands at the lower part of the wreath, where was fastened a sheet of parchment with the inscription in red and black "In Memory of Emanuel Swedenborg from the Swedenborg Scientific Association and Admirers in North America. Upsala, 19, ¹⁹/₁₀ 08."

At the present time plans are being made for a sarcophagus and decorations in the cathedral; their realization is to be signalized by an appropriate celebration, possibly in connection with the bicentenary celebration of the Scientific Society of Upsala in 1910, as Swedenborg was one of the founders of the Society. The plans are in charge of a committee in Upsala.

THE SWEDENBORG MUSEUM.

The "Swedenborg Exhibition" referred to in my last report was duly opened in a special room in the Northern Museum on May 17th. A detailed catalogue of all the objects on exhibition had been prepared, referring to several newly discovered Swedenborgiana. On the walls of the room hung portraits of Swedenborg, and of his parents, relatives and contemporaries, while in a number of cases at the sides of the room were placed on exhibition a number of his scientific and theological manuscripts and printed works, together with various historical and bibliographical volumes, etc. Swedenborg's organ, and the inlaid marble table presented by him to the College of Mines were also in evidence, as well as several other curiosities.

A VISIT TO ENGLAND.

Having been invited by the Committee of the Swedenborg Society of London to address the Society's Annual Meeting and to confer with the Committee, I travelled to England early in June and was present at the Annual Meeting on June 9th, delivering an address on "Revived Interest in Swedenborg's Scientific Works and Swedenborgiana" (*Morning Light*, June 20). A great interest was shown in the work in Sweden and in recent occurrences at Carlskrona and Upsala, and in several meetings of the Society's committee, when I was invited to be present, plans for co-operation with the Association and for the support and extension of the work were thoroughly considered. The co-operation of this powerful Society will greatly increase the scope of the work here and ensure the accomplishment of the various projects in hand.

As the representative of the Association I was received by the Swedenborg Society and also by the New Church Conference, which met at Southport, with every courtesy and hospitality. I had the pleasure of addressing the Conference and allied meetings. The unique legal and business capacity of the English was always a most striking feature of the meetings. Observing the conduct of their meetings with the eyes of a foreigner I was continually impressed by the order and dispatch with which the Chair and Secretary directed the proceedings, there being much less work on the floor than in similar meetings which I have attended in America and Sweden.

THE NEW EDITION OF THE SCIENTIFIC WORKS.

Thanks to the recent action of the London Swedenborg Society in subscribing for 125 sets of the new edition, a large number having previously been subscribed in America, it now seems certain that the *Opera Philosophica et Mineralia* will be included in the series as Vols. IV. to VI. Unfortunately, only 500 copies of Vols. I. to III. have been printed, about 400 of which are already disposed of, so that the edition will soon be

out of print. However, if plates are made now, a second edition, including those pages the type of which has been distributed, can easily be printed later on. I am now busy at Upsala part of the time collecting material for the Introduction concerning the miscellaneous contents of Vol. III., which contains much of interest in connection with the early history of the Scientific Society of Upsala.

AUGUST STRINDBERG'S REFERENCES TO SWEDENBORG IN "A BLUE BOOK."

The flood of newspaper articles on Swedenborg ceased last May, but the best known dramatist and author of Sweden, August Strindberg, continues to excite the interest of the public by extending his "Blue Book," which he began publishing last year, the work being dedicated to Swedenborg, the leader and teacher, in memory of the home coming of his remains after a century's absence in foreign soil. The appearance of new productions by Strindberg always causes a great excitement in literary circles, for his observations concerning facts and persons are so direct and oftentimes accompanied by such brilliant sallies that many are dazzled and some hurt. The publication of the Blue Book has proceeded as follows: First came Part I., which was succeeded by a separately published Appendix. Then came Part II., and this week Part III. has left the press, making a grand total of 1,071 pages, octavo, treating of everything under the sun, and presenting in fact the "Weltanschauung" of this brilliant but erratic genius. He repeatedly confesses his conversion to the religious view; accepts Swedenborg, but also theosophy; fiercely criticizes modern philosophy and science, both their spirit and results, not only zoology, botany and evolution, but also physics, astronomy, chemistry and the decipherings of the Egyptologist and Assyriologist, etc. Every few pages appears Swedenborg's name accompanied by extracts and discussions, apparently the theological writings only are referred to. Love and marriage are leading themes throughout the work. Strindberg also accepts the doctrine of the transmigration of souls. Some of the New

Church people here were rather enthusiastic when the first volume appeared, but their enthusiasm has greatly diminished. On reading the Blue Book it appears that Strindberg's conversion is genuine and permanent; the work shows a man who is in earnest and searching for the truth, but many positions are taken which agree neither with Swedenborg's theological or scientific works, nor with sound science and history. And yet "A Blue Book" is undoubtedly the production of a genius; in the midst of much slag there lies some of the true metal.

INVESTIGATIONS AND ADDRESSES.

When in England last June and July I made as thorough investigations for new Swedenborgiana as time would permit, chiefly at London and Manchester. Swedenborg's notes in a set of the *Arcana Cælestia* in the Library of the Argyle Square Society, London, have been reported in the *New Church Magazine* for September. The results of an examination of the Archives of the Swedish Church at London will be printed in due course. I found several new references concerning Swedenborg, beginning with the year 1710, the date of his first visit to England, up to a period long after his death. At Paris I made a preliminary search for a letter reported to be in the Archives of the Astronomical Observatory. At Upsala I have heard of some new particulars concerning Swedenborg's biography, all of which will be recorded in *The New Philosophy* and elsewhere.

On the initiative of Professor Karl Reinhold Geijer, who occupies the chair of Theoretical Philosophy at Upsala, two addresses by me on Descartes and Swedenborg, were announced in the list of addresses to be delivered at the Third International Congress of Philosophy, held at Heidelberg from August 31st to September 5th. The addresses were duly delivered at Heidelberg on September 3d and will appear in the Report of the Congress. The first address was on "Relics of Descartes' visit to Sweden, especially a newly discovered portrait by David Beck;" the second was on "The Cartesian Controversy at Upsala, 1663-1689, and its connection with Swedenborg's nebular

hypothesis." An address on "Swedenborg as a physiological psychologist" was delivered on October 13th before the Psychological Society of Upsala, of which Professor Geijer is President. A very interesting discussion by Professors in the Faculty of Medicine and others followed the address, the chief point being the evidence upon which Swedenborg apparently based his theory of brain localizations, the general opinion being in favor of pathological instead of experimental evidence. I may add that this is the first time to my knowledge that an address has been delivered in Upsala concerning any part of Swedenborg's scientific works, although they have naturally been the subject of considerable discussion during the last few years. My studies in philosophy at the University have brought me into touch with several men who have furnished much useful information in connection with the history of philosophy at Swedenborg's Alma Mater. It is clear enough that the whole question of the historical connection of Swedenborg's early work in science and philosophy with conditions at Upsala should be thoroughly investigated. His early scientific work cannot be clearly understood without an understanding of the conditions which prevailed at Upsala and Stockholm during the period 1650-1750. The philosophical atmosphere was largely Cartesian, and it is clear enough to any student of Swedenborg's cosmology who is versed in the history of philosophy that Swedenborg's point of departure was in several respects Cartesian; a reference to the subject by Swedenborg's intimate friend, von Hopken, also shows that this was the opinion of Swedenborg's contemporaries. The investigation of the origin and development of Swedenborg's earlier scientific works becomes much clearer in view of the Cartesian Controversy which raged at Upsala during the latter half of the seventeenth century.

ALFRED H. STROH.

Library of the Royal Swedish Academy of Sciences,
Stockholm, Oct. 16, 1908.

REPORT OF MR. A. H. STROH TO THE BOARD OF
DIRECTORS OF THE SWEDENBORG SCIENTIFIC
ASSOCIATION.

GENTLEMEN: From a recent letter received from the Secretary of the Association I learned that the proposals of the London Swedenborg Society had been approved by you. I received a letter yesterday from their Treasurer, Mr. F. A. Gardiner, saying that the Society had not received a reply from America. I have therefore written to their Committee a report, stating that I had received word of your approval and mentioning the seven specific points to which I referred in my report to you. If I receive further word from the Society I shall at once inform you, and shall, in the meantime, continue to proceed with the work as if all formalities were over.

Excellent progress is being made with the *Index Biblicus*; with the memoir on Swedenborg's remains, now being prepared at Upsala by the Professors of Anatomy; with the sarcophagus and decorations; with the completion of Vol. III., and with the proposal to include in the edition as Vols. IV. to VI. the *Opera Philosophica et Mineralia*. It now seems likely that the portion of the *Daedalus*, already printed and set up will be discarded and a fine facsimile reproduction included (also published separately), that most of the earliest treatises by Swedenborg will be included in the volume instead of a few only, and that the Introduction will be written by Professor of Astronomy Dunér, the Perpetual Secretary of the Scientific Society of Upsala. In the meantime I am winding up the latter portion of the new edition of the *Worship and Love of God* and preparing the copy for the next fascicle of Part II. of our *Treatises*.

The proceedings at Upsala last spring have resulted in a great development of interest. The Professors of Anatomy, Clason, Hultkrantz and Hammer, are preparing a memoir on Swedenborg's remains; while the Committee on the sarcophagus and decorations have met and organized, with Rector Emil Schuck as chairman, Professor of Church History Emil Lund-

strom as Secretary, and with the additional membership of Professor Dunér on behalf of the Scientific Society, Professor of Zoology Tullberg (a descendant of Linné) on behalf of the Academy of Sciences, the Dean of the Cathedral Berggren and the guardian of the property Pastor Soderberg on behalf of the Cathedral, and Captain G. W. E. Svedenborg on behalf of the family. There is to be a fine sarcophagus, possibly of red granite, of simple but massive form, with suitable mural decorations, in which the Society in London is much interested. I suppose you will hear from them about it presently.

Professor Retzius recently reported to the Academy of Sciences the proposal to include as Vols. IV. to VI. the *Opera Philosophica et Mineralia*, of which I have written fully to Mr. Doering, and also referred to the progress of the work in general. Everything is proceeding most successfully and the climax will probably come in 1910, when the sarcophagus and decorations may be unveiled in connection with the bicentenary celebration of the Scientific Society of Upsala, of which Svedenborg was a founder and most active member.

I remain, yours respectfully,

ALFRED H. STROH.

Stockholm, November 17th, 1908.

THE SENSES.

PART FOUR OF THE ANIMAL KINGDOM, BY EMANUEL
SWEDENBORG.

CHAPTER VI (*continued from Vol. XI, p. 134*).*The Tunics of the Eye.*

403. 4. *The Choroid.* 1. It is the proximate covering which communicates all the affections of the sclerotic tunic or all general modes, to the interior eye, thus it is a uniting medium, as well, namely, of the motions as of the fibres and vessels, for it receives those effects which happen in the sclerotic tunic and carries them toward the interiors, and it receives those things which happen within and carries them toward the exteriors; thus it is a mediate uniting bond. 2. It receives the vessels by means of which the blood has already been purified in the sclerotic, and carries them toward the interiors; wherefore those vessels flow in perpendicularly, so that all heterogeneous humor is exuded in this last lip. 3. It also receives the fibres which also it transmits, (according to Winslow); all action of the one with the other is communicated according to the vessels and fibres, as is known in physics; thus also the pulsatile motion of the arteries rules in the choroid, and the animatory motion of the nerves; likewise also the general modificatory motion. 4. But care is taken in many ways that these pulsatile, tremulous, vibratile, modifiable motions shall not penetrate toward the interiors of the eye except in a most general way; 5. that is to say, those motions circulate in turn from the one tunic into the other, or from the sclerotic into the choroid, and return, nor do they proceed further; there is a white band which turns the one beginning of the uvea about to the other, (strictly according to Winslow); this white band receives the tremiscences and reflects them into the other tunic, for because it is white it reflects the rays, wherefore also it reflects modifications and similar things. There is another similar band or appendix in the other center, where the optic nerve enters; these are the

foci; by this means the tremor of the one is reflected into the other, and vice versa, nor does it go inward. This seems to be done especially in order that those tremiscences shall not verge into the uvea, the iris, the ciliary processes and many tissues of this place. 6. In order also that they shall not enter singly (singularissime) and irritate the retina and the vitreous humor, care is taken by a blackness induced upon each of its layers, namely, upon the external major, and upon the internal thinner, or Ruyschian tunic; this blackness absorbs every similar modification, and confuses it so that it shall not penetrate further; thus the blackness of the external tunic absorbs the modification so that it shall not penetrate into the internal tunic and into the uvea, and that of the internal tunic, so that it shall not penetrate into the parts under the uvea, and into the crystalline and vitreous humor; thus all remain most safe and are cared for both by reflections and absorptions. 7. This tunic therefore brings it about that the entering vessels and fibres come into a most quiet state on entering the uvea, where concurs a wonderful tissue of the smallest things; for, according to Winslow, they penetrate by that way, thus by the way where all vibratory motions cease and are reflected. 8. Thus also it receives all the general modes of the brain through the optic nerve, to which it is nearest. 9. It appears to be an expansion of the pia meninx, for here the nerves, stripped of the dura mater, are surrounded by the pia mater.

404. *The Uvea.* 1. The uses of the uvea concur with the uses of the choroid in a general way; 2. but the uvea derives into itself distinctly all this apparatus of smallest parts, so that therein all things may be accomplished tranquilly according to the order of nature. 3. Wherefore the uvea is the basis of the iris, of the pupil, of the ciliary processes or fibres, of the ciliary ligament, of the arterial and venous band, of certain ducts which are called black. 4. Thus all things therein can be accomplished according to the affections of the brain, since they can be accomplished most distinctly and most quietly, because therein there is none but pure blood and distilled (spirituata) lymph; the others which are impure and which

impede, are cleansed away in innumerable ways. 5. In order that the uvea may be in this state it is fortified about by that white band which sends and reflects every exterior tremor from tunic to tunic, except where from its own softness and yielding character, and the thickness of its origin it absorbs the tremor, so that it shall not penetrate all the way into the uvea; this is from external causes if anything comes from the sclerotic, as also from the cornea; for then the sclerotic dissipates the rays and reflects them by the same way, so that thus a tremor suddenly striking the uvea is transferred by that way into the surface. 6. If there be any modification from the vitreous humor, the retina, the optic nerve, the brain, the blackness of the underlying uvea absorbs it, just as does the blackness of the choroid. 7. The uvea therefore is the plane, where a great many tissues concur of which it is the basis.

405. *In respect to the coloration of the iris.* 1. According to the exposition given above concerning colors, for a base will be white and black; for these are the bases of all colors; without them the colors which are called constant neither exist nor subsist, still less appear. 2. The black of the basis has its place under the uvea, the white possesses the circumference; thus every color is produced which is referred to both black and white. 3. The whiteness is induced by such an arrangement of the parts, that all the rays leap back confusedly and are not absorbed. 4. The blackness on the other hand is induced by such an arrangement of the parts that all the rays are confusedly absorbed; therefore the arteries in the iris are led about in little vortices, so that they may form shady little crypts in which the rays are extinguished; wherefore the black verges toward red. The little branches of these vortices are likewise led into little vortices, so that they may become still more deeply a shade, and so that that which is luminous may be still more deeply absorbed. Such most subtle little vortices with their crypts induce blackness upon waters. I doubt whether those parts of a fluid which pursue a straight line are similar, for, just as even blackness* the most general shade exists in

*There seems to be something lacking at this point.—E. S. P.

order that the lower plate of the uvea may be covered with blackness. 4. Thus all luminous modifications are absorbed within, and the greater ones flow about into the orbit. 5. Wherefore there is such a state of the uvea, that it can take on all the affections of the internal brain.

406. *The Iris.* 1. It is variously colored in subjects; the coloration shows through the cornea; it is called blue, verging to red, to green, etc., brown (*prunella*), a band of another color sometimes surrounds it. 2. It is colored according to temperaments; 3. according to affections, especially the merely corporeal, as hearing; 3. according to other affections of the animus, in which affections there is and exists some desire of the mind, whence there is a sparkling, a tremulous and more lively and more fiery or flamy state; hence there are signs from the eyes themselves of the desires of the mind, with which also exterior states correspond, that is to say, the motions of the eyelids and eyebrows. 4. Otherwise the color is more torpid, duskier and corpselike (*mortiferæ similis*). 5. Because the fibres carry with them the very affections of the animus and mind, and there rather engrave them preferably where are extant subtle and quieter concentrations. 6. They then act upon the blood vessels, and these upon the fibres; whence colors and motions concur. 7. Sometimes they turn the black of the eye into red, when the little vortices swelling with blood close up the hiatuses and little crypts. 8. The iris especially receives rays penetrating through the uvea, and indeed suffocates them by the duskier color which absorbs them; finally they are absorbed in the blackness of the posterior plate. They also dispel a part into the peripheries by way of the white band, as has been said. 9. The iris also gives to the pupil the power of dilating and of contracing which indeed is proper to the uvea and its border.

407. *The pupil.* 1. It is placed at the apex of the chamber of the eye, and on the other side of the middle of the crystalline lens. 2. It can be dilated by the sphincter or by the orbicular fibres. 3. It can be contracted by the ciliary fibres. 4. There are fibres of the cornea which pierce each layer of the

uvea, according to Winslow, thus there is a certain determination. 5. The pupil is dilated and contracted according to the quantities of light, according to the qualities of objects wherefore according to the qualities of light, according to distances, according to opposed magnitudes, according to the state of wakefulness or sleep, according to shadows, so easily and naturally, that nothing may hinder. 6. It is opened therefore according to state as the sight wishes to be sharper or duller; wherefore according to the intention and desires of the mind. 7. In this relation the crystalline lens is brought forward, or pushed back. 8. Thus all the varieties of the eye correspond to all the varieties of objects in particular. 9. Now there is a very small aperture, so small that it is almost no aperture; now a very large aperture; thus the diameter can be varied to a great extent. 10. The ciliary ligament concurs.

408. *There are many changes of state in the eye.* 1. There are the external changes by means of the lids and muscles which have been treated of. 2. The changes of the state of motion of the whole eye which have been treated of. 3. The changes of the state of the iris, according to affections. 4. The changes of the aperture of the pupil according to objects and interior states. 5. Changes of the place of the crystalline lens. 6. Changes of the state of the retina. 7. Changes of the state of the vitreous humor. 8. Changes of the state of the single parts, especially of the retina, and of the vitreous humor, which changes are infinite, and are as many as the variations of light. 9. Thus in general, particular and singular, happen the changes of state. 10. The changes of state in the eye are all to the end that external states of the body and of the world may agree with the internal states or those of the brain; for the eye is an instrument and is constituted as it were in a balance. 11. The cornea covers itself with a cloud, or makes itself clear, according to the quantity of light; thus undergoes those very changes of state. 12. It expands itself and the pores gratuitously and harmonically.

409. *The affections, which are the causes of the change of state, are many.* 1. They are the very quantities and qualities of

light and shade. 2. They are the affections arising from objects, as from single colors, from colors among themselves. 3. Those arising from forms of diverse beauty in the vegetable and animal kingdom. 4. Every form which agrees with the order of nature is beautiful, and excites love; the contrary excites aversion. 5. There are affections arising from the body, such as the corporeal sensations, pleasures, appetites and loves of diverse kind. 6. There are also similar visual affections arising from the imagination alone, which beautiful forms represent. 7. There are still further affections in which there is a certain higher beginning, as the various loves of self, of light; thence gladness, hilarity, wrath, envy, fears, revenge, etc., are the beginnings of these affections which are called the loves of moral good and evil, and others. 9. To all these things the mutations of state respond, exterior, interior and mixed. 10. Nevertheless all these arise from sensation, either external or internal, of the cerebrum or the intellectual, of the cerebellum or the natural, which is in the blood and in the spirits.

410. *Into what becoming order all these things are cast will appear, 1. from the influx of the vessels about the conjunction of the choroid and the uvea, where also the sclerotic concurs with the cornea, where there is a circle as it were a white centre. 2. That the vessels constitute a kind of arterial and venous circle from which, and by way of the periphery of the circle, they run forth toward the centre as radii. 3. From the ciliary process, or the fold of the posterior layer of the uvea, they run forth like radii toward the pupil, and imitate undulations in order that there may not be a simple circle with radii, so that the folds can be contracted. 4. The going forth of the vessels and fibres is according to these folds. 5. The insertion of the muscles between the plates, and their determination is rectilinear and articular. 6. Yea, all these things are so beautifully arranged that he who is not astonished at it, does not permit these wonderful things to reach interiorly into his higher understanding; either he is ignorant of all such things, or his zeal is altogether for his own body.*

411. *One eye, of the same kind of animals, and especially of men, is absolutely like the eye of another neither in general nor in part, nor yet in things most singular.* 1. It is varied in general figure, 2. in size, 3. in motion, 4. the albuginea is not alike, neither the sclerotic; there are endless diversities. 4. These diversities are greatest in the cornea, [which differs] in size, figure, density, pellucidity and elasticity. 5. Neither is the iris alike in color, size and distance. 6. Wherefore neither is the pupil. 7. Neither is the crystalline lens similar in size, figure, compactness, distance, and action upon the underlying vitreous humor. 8. Neither is the retina alike in one and another. 9. Wherefore neither is the vitreous humor, but indeed every part differs variously. 10. But these things agree in things most general and in the higher general. 11. Thus neither are the animus nor the affections, thus neither the mutations, constant, which are according to the tissue, and the inconstant mutations are various according to the affections. 12. Wherefore the sensation or sight is varied in all things. 13. Sight is the principal, motion corresponds to it as an instrumental, the tissue corresponds to each of them.

On the Humors of the Eye, and on the Retina.

412. 1. First we must repeat what and whence are colors and light; without a knowledge of them we shall busy ourselves about the humors in vain.

413. *The doctrine of modifications, coincides with the doctrine of the pressure of the atmospheres.* 1. For pressure is the ultimate or conatus of modifications, a like nature is in each. 2. Pressure has regard to its own centre and its own peripheries, so also modifications; the slightest pressure is in the peripheries the greatest in the centre, so also modification: in like manner they pour themselves forth. 3. Pressure has regard to every point or particle to which it equally tends from the universal, so also modification. 4. It likewise also has regard to every volume, greatest and least, in like manner modification. 5. Pressure is augmented toward lower things where it increases as the atmosphere is condensed, so also modifica-

tion. 6. Pressure likewise respects every concave as well as convex surface, in like manner modification. 7. Pressure acts according to its column, in like manner modification. 8. Pressure from the smallest aperture acts upon the greatest space contiguously, likewise modification. 9. Pressure passes through tortuous canals similarly as through straight ones, and exercises its force upon the underlying volume, likewise modification (*pressio?*) as it penetrates, according to influx, through the unequal pores of the vitreous humor (*vitri?*), howsoever unequal they are. 10. Pressure rebounds or is deflected according to the plane of the object, and strives to go thence in a right line, in like manner modification. 11. The nature of modification can be further explained from the nature of pressure, and the nature of pressure from the nature of modification, and thus can be not only illustrated but extended.

414. 2. *The quality of pressure has been discovered, especially by experience, from liquids (aquis) and the aerial atmosphere.* 1. For therein are ultimate effects, presented even before the eye. 2. Thus from pressure in the air one can conclude concerning pressure in the ether, finally of the pressure in this purest [atmosphere]. 3. But a cognition of the more perfect forms only is necessary. 4. For the pressure and modification of the purest or celestial aura is into the celestial form, that is to say, the general pressure and modification of all the parts and their concentration toward their every single part. 5. Because excentric [pressure] acts upon this its own part by concentration into the inferior or vortical form of fluxion. 6. Thence by this form they act upon every part of the ether, which in a similar manner, but through a vortical form, is driven about; this form by acting upon its own parts is again driven about, and ceases in every aerial part; therein takes place a spiral action of every aerial part. 7. This spiral action acts in a similar manner upon its own [part], whence results the circular form; the determination of which is from the periphery towards centers; thence [is the action of] water. 8. Thus the one results from the other by the determination alone according to which all things are arranged.

415. 3. *Thence will appear what light and colors are.* 1. For light and colors are merely modifications of the atmospheres. 2. Wherefore they are active forces of which pressure is the conatus. 3. All essentials of conatus become free in modification as in local motion corresponding to them; thence also are celerities and many accidental things. 4. A particular is never given except from its own general; for without the general the particular flows away without rule and distinction. 5. Wherefore a distinct general postulates a distinct particular; the one respects the other as its own basis. 6. Shade and light are the generals and bases of colors. 7. Shadows and lights must be arranged in becoming order before particulars may appear distinctly. 8. Thus in glass globes, in drops, in prisms and in other things where two reflections present colors; the first reflection only arranges the light and shade in order that its differences may be rightly [apprehended], the other presents the colors respectively to these their bases. 9. In constant colors likewise, whiteness and blackness are the bases of the colors; then all the varieties between whiteness and blackness, in which two there is no color as neither is there color in light and shade first reflected. 10. Whiteness arises from an irregular reflexion of light, blackness from the absorption of light; intermediates present common differences, as the bases of colors. 11. Wherefore whiteness and blackness are induced by composition of the more open parts, or by the greater degree of the compositions, which makes the larger pores. 12. Colors then are variegated according to the reflection of light by the particles of the more simple composition. 13. The more these reflect of light or shade the more another color follows. 14. Wherefore this is the mode of reflected light and shade, which reflection presents colors. 15. In order that this mode may exist, it is required that the form of the reflecting particles be variously spherical, angular, concave, etc. 16. Thence colors are conditioned according to the forms or figures of the particles, thus of the smallest thing. 17. Thence the attributes and diverse qualities of colors derive their varieties. 18. That every particle

shines through in the least particles. 19. Wherefore all things come forth from the arrangement of the particles and the thence arising determination and dispensation of the rays. 20. Wherefore the corpuscular doctrine is required for the examination of colors.

The Humors and Sight.

416. *The aqueous humor.* Its uses are as follows: 1. That it may fill the chambers lest they collapse. 2. That it may anoint the parts of the uvea, the iris, and more, on both sides, in order that they may rightly perform their offices. 3. So that the uvea, pupil and crystalline lens may be freely moved as though in their own atmosphere; wherefore that humor seems to be but little elastic. 4. That it may transmit the rays of light from the cornea toward the lens—all things regularly. 5. That the parts may be equilibrated against the pressure of the outside atmosphere; then also against the vitreous humor, the crystalline lens mediating. 6. It seems to slip in between the plates of the sclerotic and to be exuded from the arteries, so that the purest blood may come to the uvea, for which reason only this blood serves it. 7. It seems to be exuded in like manner from the internal arteries which penetrate the uvea, which is a final purification of the blood. 8. Thus this humor although separately (*secretus*) always performs a use on the way, for there is a circle of uses. 9. Wherefore from the greatest peripheries and from the greatest motion about the conjunction of the sclerotic and the cornea it enters the place of the greatest rest. 10. It afterwards seems to be exuded through the pores of the cornea (for the cornea being touched the humor breaks forth), in order that it may always be fresh and pellucid. 11. Thus it again performs a use outside the uvea over the eye. 12. It seems that it can be shown that although the crystalline lens is variously moved, still that this humor does not occupy any more space; for at the bringing together of the uvea and the lens of the posterior chamber, the cavity is extended sidewise over the

ciliary ligament; at their removal from one another, however, it is contracted; for their slipping together and apart is not so very quick; furthermore it is probably somewhat elastic, because it is but slightly viscous, so that it may yield.

417. *The crystalline humor or the crystalline lens and its uses.* 1. This humor or lens exists in order that there may be a hedge between the aqueous and vitreous humors. 2. Thus that there may be a covering for the vitreous humor itself. 3. In order that it may receive the light and its rays, and carry them back into the retina in the most orderly manner. 4. It inverts the ray in an orderly way so that what flows in from the right may flow into the retina at the left and vice versa. 5. This is in order that it may adapt the general state of light and shade in the vitreous humor, and it is thus the organ for conserving that state. 6. The vitreous humor itself is what applies itself to all general states, (of which below); that humor therefore arranges the lens, wherefore the lens is situated in a fold of the vitreous and arachnoid membrane, so that it may obey every mutation of its states. 7. In order that it may perform these things it is necessary that it be pellucid, formed of plates rather than panels (*tabulis*); 8. so that it may be of a consistency not hard, and that it may not act violently: wherefore if the pellucidity and softness perish, to that extent the sharpness of sight perishes, as happens according to age; see Winslow, Petit, and many others; 9. so that it may be convex on both sides. 10. Wherefore the crystalline lens is vibratile according to all the general mutations of the state of the eye; it is as it were a balance whose two scale-pans are, the one which sustains the external changes of state or those of the world, and the other which sustains the changes of the state of the brain, wherefore those arising from the state of the optic nerve and of the retina: wherefore a tunic of the vitreous humor surrounds it, and at the same time a reticular tunic or web of the retina, which accompanies it thither, thus in order that every general state may circulate to the lens as to its own fulcrum, and on the outside according to the state of the uvea, which acts upon the same lens by the ciliary ligament,

wherefore by its own fibres, according to the external state of light and shade. 11. Thence the affection returns immediately to the brain, and at the same time the affection returns instantly into the retina and the crystalline humor, which retina and crystalline humor concur to induce a change of state immediately upon the lens, as in the other sensories. 12. Wherefore the crystalline lens is a concentration of the general states, to which it adapts itself, from a concourse of which it coalesces, is renewed, and perfected; thus also its state is changed according to the change of state of the eye itself. 13. For there is thus a correspondence of all things involved. 14. In order that the circulation may do this, it seems that the lens ought to consist of plates, and that the plates ought to be separated from each other by a thin fluid; 15. in order that it may take away every active force from the luminous rays, and that a conatus may remain, as in the labyrinth of the ear; 16. then in order that it may temper and suffocate other hurtful vibrations of light and of rays. 17. The purer part of this humor seems to be absorbed by its own little veins in the uvea.

(To be continued.)

Notes and Comments.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The Annual Meeting held at the Johns Hopkins University in Baltimore during the holiday week of 1908, was very largely attended and presented a programme of meetings, sections and subjects of discussion of a complexity that seems to increase with the problems of science itself. Our Association was represented among the membership present by Professor Riborg Mann, of Chicago University, secretary of the Educational Section of the main body, Messrs. Hite and Sewall in the affiliated American Philosophical Association, Dr. John R. Swanton in the Anthropological Section, and possibly others whom we had not the good fortune to meet.

In the Philosophical Association the papers formed an almost continuous discussion of the opposing principles of Idealism and Pragmatism or as some would mistakenly term this opposite, "Realism." The obscurity in the minds or at least in the presentation of many speakers as to what realism or reality is rendered practically resultless many of the papers read. By some it was evidently identified with gross matter, by others with some subtler forms of material substances such as ether or the nervous fluid or something of the body, or of sense and so contrasted with the ideal as something purely subjective and of itself having no reality. Dr. Woodbridge, of Columbia, spoke of certain sense qualities existing in the environment but "without consciousness." The idea of the real as the inmost *res* or being of which the *idea* is the form and the nervous sensation and motion the *action* or effect, seemed to be much overlooked as if these grand words, REAL, IDEAL and ACTION, in their orderly trinal relation and succession had never been given to philosophers as well as to common-sense thinkers from the days of Plato down to Swedenborg. The Divine Trinity, answering to the real, ideal and actual, is in Swedenborg the *esse*, *existere* and *procedure*, or Love as the Real, and the primal *Sub-*

stance; Wisdom as the Ideal and the essential *Form*; and Use as the Actual, the pragmatic ultimate in which real and ideal come to their effect in *work*. The tourney on Thursday morning when Royce, as the Idealist, was met in open field by Dewey, the Pragmatist, and Woodbridge, the Sensationalist, was brilliantly imposing, but without real result, for the very reason that each speaker would use fundamental terms in a sense different from that of his opponent. The playful and futile character of such discussions where the central idea of the real or of substance is tossed about as an after thought or something to be evolved out of some occasional stimuli or other, was quite apparent, when Professor Royce, at the close of his brilliant defense of idealism, challenged his opponents to come forth and do their best in demolishing him with their "realest" weapons, the while they were all the same "exercising themselves in the practice of an unconscious idealism!"

Professor Munsterberg, who was president this year, of the Philosophical Association, delivered his President's Address before a large audience in the Assembly Hall of the City College on the "Problem of Beauty." The paper was beautifully written and read with the professor's customary vehemence of expression. It set forth an æsthetic without a moral content—or beauty as existing in a sheer delight of experience in itself without relation to any truth as its cause or inmost good as its end.

The Southern Society for Philosophy and Psychology was presided over by Dr. J. Macbride Sterrett, of the George Washington University, of Washington, who is president of the Washington Society for Philosophical Inquiry. The matter of the psychological papers was very largely physiological rather than psychical. Dr. Sterrett, in his annual address suggested as a suitable name for the new experimental or laboratory psychology which seems to belong to physical science rather than to philosophy the name *hypo-psychics*, meaning the science of what lies below the soul, just as *metaphysics* was the term used by Aristotle, to mean that which is above or beyond the physical.

F. S.

THE HEIDELBERG CONGRESS.

As representing the Swedenborg Scientific Association and the London Swedenborg Society, Mr. Alfred H. Stroh visited the International Congress of Philosophy, held in Heidelberg in August of last year in company with Professor Karl Reinhold Geijer, of Upsala University, and presented before the Congress two papers on "Descartes and Swedenborg." The first address was on "Relics of Descartes' visit to Sweden, especially a newly-discovered portrait by David Beck;" the second was on "The Cartesian Controversy at Upsala, 1663-1689, and its connection with Swedenborg's nebular hypothesis." The portrait referred to is not generally known. It turned up in the Astronomical Observatory at Stockholm, and is now in the Hall of the Academy of Sciences. Descartes died at Stockholm on February 11th, 1650, after a visit of but four months. Subsequently, 1663-1689, a fierce Cartesian controversy broke out at Upsala, which evidently had its effect upon late generations of students, including Swedenborg, who was a student at Upsala from 1699 to 1709. The latter portion of the second Paper discussed the relationship of the cosmologies of Descartes and Swedenborg in so far as the "vortices" are concerned, and also gave a brief account of Swedenborg's nebular hypothesis as set forth in his "Principia." Both of the Papers will duly appear in the *Report* of the Congress.

PROFESSOR RETZIUS

ON

SWEDENBORG AND THE SENSORY CENTRES.

From the Croonian Lecture before the Royal Society on May 14th, 1908, on "*The Principles of the Minute Structure of the Nervous System as Revealed by Recent Investigations*," we present the following extracts:—

"The scientific investigation of the histology and physiology of the central nervous system, above all of the brain, is surely one of the most difficult problems presented to human intelligence to solve. With good reason Emil Dubois Reymond's famous ejaculation: 'ignorabimus,' may be applicable here.

“*E pur si muove.*’ How rapidly has our physiological knowledge of the *motor* and *sensory centres* in the brain—since Fritsch and Hitzig first showed their existence by experimental proof—gone forwards, step by step, owing principally to the brilliant discoveries of the English investigators, Sir Victor Horsley, Schaefer, Beevor, Ferrier, Sherrington, and still others.

“It is indeed true that the proverb, ‘There is nothing new under the sun,’ is not without an illustration here, too, for one cannot be astounded to find that, as far back as the year 1744, the Swedish polyhistor and scientist, Emanuel Swedenborg, was able, in his famous work ‘*Oeconomia Regni Animalis*,’ with his prophetic vision to set up as a goal for the science of physiology of the brain the following standard: ‘*Experientiae est et temporis, ut investigetur quis gyrus et quis serpens tumulus in cerebro hunc aut illum musculum ut correspondentem suum in corpore respiciat,*’ and ‘*Ergo inquirendum venit, qui tori corticei his aut illis musculis in corpore correspondent: quod fieri non potest nisi per experientiam in vivis animalibus, per punctiones, sectiones et compressiones plurium, perque inde in corporis musculis redundantes effectus.*’ As we see, this is nothing short of a full programme in the experimental physiology of the brain, which this marvellous man here lays before us; and we are yet again amazed to read his clearly-worded statement, that the muscles of the lower extremities have their centre at the top of the cerebral cortex, the muscles of the abdomen and thorax in the central portions of the cerebrum, those of the head and face at the bottom, ‘*nam videntur ordine inverso sibi correspondere.*’ It has been my purpose in quoting theses of Swedenborg to point out that grand scientific discoveries, of which our own age is rightly proud, may have been not only vaguely guessed at, but actually set forth in clear and definite terms by one or another brilliant enquiring mind of an earlier age. The theses cited are drawn up with such precision by Swedenborg that they cannot possibly be based on divination only, but must rest upon a real grasp of natural phenomena as well as on actual experiments and dissection-work.

"A more thorough knowledge of the minute structure of the brain and the whole nervous system was essential, if the physiology of these organs was to advance. To that end the perfecting of the microscope was a *conditio sine qua non*. Earlier anatomists, *e. g.*, Leeuwenhock and Malpighi, had paved the way, it is true, to our present results, but did not proceed far themselves. In accord with the last-named great Italian scientist (Malpighi), Emanuel Swedenborg, put forward a remarkable theory regarding the composition of the cerebral cortex, which he—in opposition to so many anatomists of that day—definitely declared to be the seat of the psychical phenomena."

Reviews.

WORLDS IN THE MAKING.

This is the title of the new book of Professor Svante Arrhenius of the Royal Swedish Academy of Sciences, a member of the Swedenborg Commission and the writer of the introduction to the *Cosmologia* of Swedenborg. Professor Arrhenius' book in its English translation is a very attractive treatise written in popular style so far as possible in treating of such a subject, and quite extensively illustrated. Naturally it treats of not only the formation of the separate planets, but of the suns and of the universe as a whole without speculating beyond the plane of purely physical phenomena. In such a cosmogony we would naturally expect to see Swedenborg's theories mentioned, and we are not disappointed. The author gives Swedenborg his due place in the history of the solar vortices and of the nebular hypothesis, dating his promulgation in 1734, thus long before the announcement of Kant and Laplace. The references to Swedenborg are but brief, but so are those to the great rivals, Kant, Laplace and Buffon, and Swedenborg's ideas summarily stated are given quite as much weight as the others. The book is devoted for a considerable part to the theory of the evolution of species, which so far as we know originated with Professor Arrhenius, although he refers his theory back to some suggestions thrown out by the late Lord Kelvin,—the theory, namely, called Panspermia, which holds that the entire interstellar space is filled with germs of life thrown off from suns or planets in some great collisions or combustions and that these germs planted by meteoric or other means have served to introduce the animated and vegetable species into the many existing worlds. The book is of moderate size and is published by Harper and Brothers.

In the article—*Transmission of Life Through the Universe*, by Svante Arrhenius, translated by J. E. Fries, in the *Monist*,

April, 1908, Professor Arrhenius discusses Spontaneous Generation, advocating, rather, the doctrine of life coming only from the living germ, and describing the possible migration of such germs through the ether, from one planet or solar system to another and their survival during aeons of time. Millions of years and of miles are treated like the ring of a circus rider by the wide glance and clear, scientific imagination of this brilliant originator of the Panspermic Theory. But the question remains answered, indeed not even asked by him. From what then did the first germ come?

. . *The Evolution of Life or Natural Selection in Inorganic Matter*, by John Butler Burke, in the same number of the *Monist*, treats all matter as mind and mind as matter, by reduction of the atoms and electrons to Leibnitzian Monads possessed of consciousness, direction or choice; thence natural selection in the atoms. Life in inorganic and organic matter differs only in degree according to this writer. "Even atoms and molecules are thinking and alive."

Life and the Soul. In treating of the *New Vitalism* Dr. Paul Carus concludes that life is eternally existant and that "soul" is the "innerness" of things. Every atom possesses that innerness in a potentiality of feeling out of which through organization the soul is woven. Feelings develop through memory into sentient symbols and the soul is a system of sentient symbols. As in chemical reaction, the animal can adapt its reaction according to circumstances which will serve its own needs, and thus the most important consequence of the nature of the soul as a "system of sentient symbols" is the possibility of purpose. Metabolism or *Stoffwechsel* is the constant change of matter that constitutes the life process—the turning of the new material derived in food and breathing—oxygen, hydrogen, nitrogen, and carbon, into structures of an organic life. It has two processes: Anabolism or "building up;" Katabolism or "breaking down;" Anabolism by nutrition and storing of energy, Katabolism by exhaustion and fatigue. Life is not a substance nor even an energy, but simply a question of form.

The student of Swedenborg from the view-point of the doctrines of end, cause and effect, and of the *esse* and *existere* of things, will be interested in the varied attempts shown in such studies as these to arrive at the real essence and origin of the phenomenal world. There is something winningly frank and ingenuous about Arrhenius' broad outlook upon the universe without any attempt to get beyond it or into its depths. He is content to find germs flying about through space, ready to distribute species here and there through the planets without asking what a germ is, or how it ever came to be a germ at all, or how germs were manifold and not one. It is pleasant to join in his merry dance of the germs and to feel the satisfaction of having silenced so many perplexed inquiries. For if we go farther in the speculations of the other writers here named we come to only partial satisfaction and oftener only into deeper perplexity. Leibnitz's monad theory is, doubtless, freighted with important truths which are yet to be justly appreciated by science; but we hardly conceive of Leibnitz's monad being of the mind stuff itself and so as making mind and matter identical. Swedenborg says there is a discrete degree between them like the degree between cause and effect. If the scientists will only adopt this definition of Swedenborg that matter is "the thing effected" or made (*factum*) instead of the making thing—which, after all is said, can only be mind—they would escape many of their present confusions. It is hopeful to see Professor Carus, therefore, striving after a better vision of this thing-making factor, mind, even to giving us a theory of the evolution of "purpose"—through the animals' "adaptation of reaction according to circumstances." But why again should the animal so adapt, if it had not a purpose beforehand for doing so. How came there to be a system of sentient symbols—if there was no "purpose" directing its growth? Is a system ever the result of an accident? And is purpose nothing else but a kind of afterthought which we read into these accidental "systems" and then trick out with the names of adaptation, intelligence, reason, end, knowing all the time that there was no such thing there and that "systems"

that got along all this time without any purpose but only with the "potentiality of purpose" would have no difficulty in getting on for the future as well without bothering themselves with this nightmare of our "Endzweck!"

Instead of life and purpose and thought in the molecule being a dull kind of molecule intelligence Swedenborg would represent it as divine and perfect just in the degree that it is remote from the limitations of man's free thinking and invention. Compare any invention of man with the divine art in making a snowflake or a rose or in shutting up the forces of future industries in the particles of invisible ether! We do not mind Professor Carus telling us that "Life is not substance, but rather only a Form" for this seems a way of acknowledging that nature and man are not life, but only "recipients of life," which is Swedenborg's teaching. But if life is according to Professor Carus "not substance"—we would like to ask him to tell us what *is* that substance of which life is the form?

Professor William James having in his "Varieties of Religious Experience" reduced religion to a disease, and found a plurality of gods to be a comfortable conclusion of the reason, and having found in Mrs. Eddy's Christian Science and the Indian Yogi examples of the reserve force of human energy and in Pragmatism a method of manufacturing truth out of ultimate experience,—comes out now in the *Hibbert Journal* for January with an enthusiastic article relating to the theory exploited by the German Fechner in the middle of the last century, which represents the Earth as an organism having a soul of which all the parts and inhabitants of the planet are little cellular souls; and that this Earth-soul is a kind of Guardian Angel over the inhabitants of the earth, knowing the interiors of their relations and needs and exercising a kind of divine Providence or weather-bureau look-out for their future needs. This planet-soul with other planet-souls would seem to make up a kind of olympic court of the gods and so fall in with the author's favorite pluralistic theology. The worship of sun or idols, or ancestors and wells and mountains—all seems to fade into intangible vanity when compared with the adoration of the Earth-

soul as here portrayed by the ever brilliant pen of Professor James.

Even Pragmatism has had to give way at last to the onward sweep of Psychic Research and Spiritism in the pages of the *Hibbert Journal*. Swedenborg's relations of "things heard and seen" seem tame and colorless beside the rose-tinted soul-symphony that occupies pages and pages of this Oxford journal of advanced thought and criticism, where a Mr. Myers and a Mrs. Piper and a Mrs. Holland seem to be dreaming or seeing together certain visions called up by melodious lines of Tennyson one hardly knows where or how; and even were this more clearly known it is hard to conceive how such confused experience as this conduces to any inspiration or aspiration for human minds toward anything beyond the reader's sense of weariness and disgust at labor thrown away.

F. S.

THE NEW PHILOSOPHY.

VOL. XII.

APRIL, 1909.

No. 2.

BEING AND EXISTENCE.

A PHILOSOPHICAL DISCUSSION.

BY FRANK SEWALL.

IX. WISDOM THE FIRST FORM.

We have seen that love is the necessary essence of being, so far as being exists or stands forth and causes other things to exist or be created. And this love is life; or it is ESSE conceived of as in motion and moving to an end. Life, motion, force, all these suggest the primary substance and activity out of which a world of things indiscriminately might come; but a chosen, definite world, a world with an order and form, a *cosmos*, could only come from this life, motion or force directed *to an end*; and the only name for this force and motion directed to an end is love. For love is not indiscriminate; there can be no love except for a certain thing to be loved.

From this all-begetting and all-originating love there comes the first direction of the motion to an end—this is the *begetting or the evolution of form out of substance*. It is in the physical plane the motion of the first point into the line, or the defining of space, that gives us the element of natural or physical shape and bulk, and so gives us what we know as matter.

But the self-direction of love is its *knowledge how or by what intermediate causes to produce its effect*, and this knowledge how as pertaining to love itself is nothing else than the sapientia, (from “sapere”—to know how) wisdom. Wisdom is, therefore, the first product and the form of love; it is as necessary a counterpart of love as love is of pure being; for as pure being could never exist or stand forth in creation without love as the first motor, so could love never proceed to the creat-

ing of its own objects without the wisdom by which out of love's own substance these particular things are to be formed. Therefore, by this wisdom, called in revelation the Word or the Logos, all things were made that were made; and this same wisdom or Word is the very and only Form in which Love, or the primary Substance, can reveal itself to the world of its own creatures.

X. DIVINE PERSONALITY.

We see, therefore, that the necessary postulate that "the *esse* exists" renders equally necessary the postulate that the primary substance, or that the very essence of being is love, and that the very form of that essence is wisdom. Love's procession through cause to its own effect is law itself, and order itself. Law is derived from no other source than *love's self-knowledge*; and love's only begotten law is wisdom. The existence of the visible universe, therefore, compels our rational assent to these propositions:

- I. That existence implies *esse*, pure being that exists.
- II. The pure being or *esse*, in order to exist or stand forth from itself must be self-moved to this end.
- III. This self-motion exists only in volition, and volition or that motion self-determined to an end, we name love.
- IV. But self-motion to an end is likewise self-direction, which is the origin of form and of law.
- V. The self-given form or law of the original e-motion of pure being—love—is wisdom.
- VI. Therefore, love and wisdom constitute the first substance and first form, or they are Substance itself and Form itself, from which are all finite substances and forms. In these alone pure *Esse* exists, and from these alone can a world of things be produced.
- VII. But love and wisdom are human or what we can alone name *personal* attributes. They constitute our idea of person, and we can conceive of them only as residing in a person.
- VIII. Hence the first substance, force, motion, and life, from which is all finite existence, is *personal* substance, force, motion and life.
- IX. But the only name of such an original being of love and wisdom, or all originating Person is God.

X. God, therefore, is the ESSE existing, *or* Pure Being standing forth in knowable form.

We have thus from the doctrine of the pure being, unknowable except as to infinity and eternity, arrived at the doctrine of God, knowable because existing, standing forth to our knowledge, as not only divine Substance, but as divine Form, as divine Love and divine Wisdom, and, as, therefore, the Father and creator of all worlds and all things. We are thus prepared intellectually, that is, with rational assent, to enter into these declarations of Swedenborg, regarding the Divine essence.—*T. C. R.* 36.

I. God is Love itself and wisdom itself, and these two constitute his essence.

II. God is good itself and truth itself, because good is of love and truth is of wisdom.

III. Love itself and wisdom itself are Life itself, which is life in itself.

IV. Love and wisdom in God make one.

And further: *T. C. R.* 49;

V. As infinity, immensity, and eternity appertain to the Divine ESSE, so omnipotence, omniscience and omnipresence appertain to the Divine Essence, and these three are properties of the Divine Wisdom derived from the Divine Love. For these three proceed from the Divine Love and Wisdom much in the same manner as the power and presence of the sun of this world, and in all its parts proceed from the sun's heat and light.

XI. OMNIPOTENCE, OMNIPRESENCE, OMNISCIENCE.

Here, then, we have the entire doctrine of God, namely, as to His Divine Essence, which is Love and Wisdom, and His divine properties, which are omnipotence, omnipresence and omniscience, and we are to note that these properties are those of the Divine Wisdom as derived from the Divine Love. This means, in other words, that God is all powerful because Divine Wisdom derived from divine Love has all the ability there is. Not only is knowledge power, but all power is in the knowing how to do the behests of volition. It means that God is all-

wise because the divine Wisdom derived from the divine Love is all-wise, knowing, as it must, all the ends of divine Love. It means that God is everywhere present because the divine Wisdom derived from the divine Love is present in everything that love has created, and is instrumental to this very creation and preservation in existence of these several things.

XII. WHAT IS ORDER?

Again, Swedenborg says: "The omnipotence, omniscience and omnipresence of God cannot be known until it be known what is meant by order and until it be ascertained that God is order, and that He introduced order into the universe and all its parts at the creation. The omnipotence of God in the universe and all its parts proceeds and operates according to the laws of His own order."

"Order is the quality of the disposition, determination and activity of the parts, substances or entities, which constitute the form of a thing, and whereupon its state depends; the perfection of which (state) is produced by wisdom operating by love. By substance we mean at the same time form because every substance is a form, and the quality of a form is its state, the perfection or imperfection of which results from order."

"God is order because He is Substance itself and Form itself. He is substance because all things that subsist derived their existence originally, and continue to derive it, from Him; and He is Form because all the quality of substances did originally and does arise still from Him, and quality can only be derived from form.

"Now as God is the very, the one only and the first Substance and Form, and at the same time the very and only Love and the very and only Wisdom, and since wisdom operating from love constitutes form, and its state and quality is according to the order inherent in it, it necessarily follows that God is order itself, and consequently that He introduced order both into the universe and into all its parts, and that He introduced the most perfect order.

"God by virtue of his omnipotence cannot effect such things as are contrary to the laws of his own order established in the universe or prescribed in the nature of every man."

"That God *perceives, sees and knows* all things even to the most minute which are done according to order is a consequence of the *order of nature which derives its universality from the singulars of which it is composed*; for singulars, considered collectively, are termed a universal just as particulars considered collectively are called a whole; and the universal together with all its component parts is a work that coheres together as one, so that no one part can be touched and affected but all the rest have some perception of it." —T. C. R., 52-60.

XIII. THE KNOWLEDGE OF OPPOSITES.

God is also present with things which are not in the order of creation, by the *perception of the relation* of such things to such order. He is also cognizant of things which are not in order, by *his perception of opposites, or of their opposition to that order*.

God is omnipresent in all the gradations of his own order from first to last, therefore, in all the created world, and all its minutest particulars; for it is from single things being in order that there is such a thing as universal order. The presence of God in the single things of order is, therefore, at the same time the omnipresence of God in the universal order and in all creation. God is present in the single things of order just as the heat and light of the natural sun are present in every least thing that has physical being, for as we have seen the divine Wisdom derived from the Love itself creates and gives order to all things. God, therefore, by *virtue of his order and not by virtue of his spatial extension*, is present in everything of the created universe. God is not extended any more than we can speak of love or wisdom as extended; and yet God is in all space and everywhere because his order, the form impressed on the world from his ever-creating and ever-present love and wisdom, is everywhere. What we say figuratively or after an image of the truth in regard to a great work which a man has planned or which he directs and governs, namely, that "the man is everywhere in it," means that his mind has shaped its every detail, and is constantly aware of what is being done.

So we may say, not figuratively, but really because of that foremost reality from which are borrowed all human figures and images, that God although not extended in space, because not created, is nevertheless present in all space in all the gradations of his own order.—*See T. C. R.*, 63.

XIV. "IN SPACE WITHOUT SPACE."

This *being present in space without spatial attributes*, is becoming a fact or a condition more easy for us to realize, owing to the marvellous modern inventions by which space and time seem practically annihilated so far as mental contact is concerned, even when the bodily subjects of this contact are as remotely fixed in space as ever. The magnetic or aural wave seems to travel with almost the rapidity of thought itself, so that the personal presence of beings hundreds of miles apart is as immediate almost as their mental presence by mutual recollection. Moreover, it is said that there are visible stars in our firmament so distant that a ray of light coming from them to us occupies thousands of years, and that consequently when to-night we look at one of those stars we are actually "in time without time," since we are beholding in this present moment to-night things which are happening three thousand years ago, or in the time of King David or of the Trojan War. If, then, a "thousand years may become but as yesterday" in the sight of even finite man, how much more must it be so in the case of the infinite Wisdom. Not that we should, however, think of the Divine as being "not in space" because located somewhere above or out of space, and so as communicating with us by thought or otherwise from *afar off*; but rather is related to space just as the idea and motion of a work of art is related to every part of the work, or as the thought of a writer is in every word and on every page of his book, and as the life of man, as his volition and thought are in every part of his body. So may we conceive of God by his love and wisdom, and, therefore, by his order or what the scientist calls "law," being present in all space without being spatial, and thus as omnipresent in the whole universe of his creating.

It is as life, as the substance, the essential love itself, that

God truly is in all things and is their very being; but it is by virtue of wisdom as the form of all forms that *we think ourselves apart* from God, and think a nature outside of Him; and thus we think a space which *He* is not, and think Him afar off. For it is thought that makes a many, and thus separates; while it is love that draws together makes a one. And God, then, could be no One, such as love desires, that is, no One as the union of many, except the thought had made the many by means of diverse forms and qualities. The omnipresence of God, therefore, is not only that of the Divine order or law in all the divine things of creation, but it is that of his *own divine love in all the forms of his wisdom*. It is the presence, therefore, not only of the cause in all the effect, but it is the presence of the End in all the causes.

Therefore, we arrive at a rational apprehension of the complete doctrine of the unity of God as set forth by Swedenborg in these words with which we conclude: "God is in all space without space and in all time without time; consequently the universe as to essence and order is the fulness of God. It follows, therefore, that by his omnipresence He perceives all thought, by His omniscience He provides all things, by His omnipotence He operates all things. Hence it is plain that omnipresence, omniscience and omnipotence makes a one; or that one implies the other, so that they cannot be separated."—*T. C. R.*, 63.

(*To be continued.*)

THE SENSES.

PART FOUR OF THE ANIMAL KINGDOM, BY EMANUEL SWEDENBORG.

CHAPTER VI. (*Continued.*)

418. *The vitreous humor and its uses.* 1. The vitreous humor exists that it may receive the rays, the differences of light and shade, colors, images thence arising, and refer them distinctly according to rule to the retina, which without such an intermediate humor could not easily be done. 2. That it may fortify the whole retina, in which is the sensory, and preserve it, so that it may remain in a state of integrity; wherefore, it is furnished with a double tunic, and in the farthest part is applied tightly to the retina. 3. This humor exists in order that it may receive every general change of state, as well that which comes from external light, as that which comes from the brain through the optic nerve, and the rest of the nerves; and it altogether accommodates itself to this end. 4. Wherefore, by the expansion and contraction of its parts it acts upon the crystalline lens, and in like manner upon the retina in every direction, which follows from the connection of the parts. 5. Thus as a balance it accommodates both the external and internal state; the external, according to the intenseness of the light, in like manner the internal, according to the state of thought of the brain or the internal state, lest the one confuse the other; this accommodation cannot be accomplished without the vitreous humor. 6. By the contraction of the parts it draws the lens and relaxes the retina to every mode and manner, vice versa by its expansion. 7. Thus it induces upon the retina every general state, which contingency, affections and many more things plead, so that under the regular general state particulars may be more regularly and distinctly marked out for every mode of procedure, and thus that states general and particular may coincide, 8. and this according to the ratio as well of the quantity as of the quality of external and internal light. 9. These parts of this substance seem to be formed al-

together for the modification of the ether, to the end that its general modification may be concentrated into every part, and at the same time spread abroad into the whole periphery, according to the nature of that modification. 10. Wherefore they do not seem to be dissimilar to the parts of the ether in so far as its modifications are concentrated in those things while they are dispersed into the periphery. 11. In order that the communication may be better, every part communicates with its general through septa and very thin threads (*licia*) as elsewhere in the body, according to Winslow. 12. Although on this account there are little septa lest the parts be moved from their own place, according to the nature of that modification. 13. Then in order that they may always have a care for the fluid, and that the fluid may be excreted by this way, thus may be in a perpetual state of renovation. 14. Wherefore it is like the white of an egg, and after death (*moram?*) it evaporates. 15. It seems to be composed of the fluid which flows between the fibres through the optic nerve; perhaps also through the somewhat larger tubules which those fibres form; and its falling in seems to be from periphery to periphery, and to be a perpetual communication, and its falling out along the septa into the common membrane and its folding, and to be led back through the fibres thence originating as it were corporeal, and through the capillary veins.

419. *The retina,—its uses.* 1. The retina exists in order that it may receive all images and rays distinctly, which are projected through the crystalline lens and the vitreous humor, 2. that according to quality and quantity it may apply them to itself, and through the fibres of the optic nerve refer them to the common sensory or the brain, where similar [images] may be received as in the rest of the sensories. 3. In order that its purest organic forms, which cannot be distinguished by the microscope, thus they seem to be formed, may receive distinctly every variation or color of light and shade. 4. Of what quality these forms may be, can be conjectured in some manner from the labyrinth of the ear, namely, that they are most wonderfully convoluted, so that they are able to receive and adapt to themselves every difference, for the little organs are

multiplied as in the whole purer world. 5. That these forms are altogether agreeable for the modification of the ether, as the cochlea is for the modification of the air, is indubitable; but how far they are of such a quality can not be disclosed, except in a prolix manner by comparison with those two organs, and by the elevation of this comparison to a superior power and perfection. 6. All rays have in themselves a certain general state, whence there is an affection; all rays have between them a general state, whence again there is a composite affection; for particulars according to their harmony and disharmony form a general state, thus particulars among themselves form a more general state and so forth. 7. Wherefore the retina changes its states for every moment of sight; in order that this state may agree with single things, the vitreous humor is interjected; and at the same time its little sensories present to a kind of whole reticular [surface], so that particular images as soon as taken may return into the general, and communicate themselves with all the little sensories; where they concur about the crystalline lens, and cause that a certain effect may always return. 8. It has been found that the great medullary part can compress itself into a very small peduncle, as the arch of the fornix in the brain, the peduncles of the cerebellum, and thence amplify themselves, and spread themselves over an immense space, for the fibres can be continued and convoluted and can spread themselves abroad, thus that while the optic nerve at first contracts itself into a peduncle; thus also effects are more certain if the fibres are at first contracted. 9. Every single fibre then carries away its own particular, all at once their own general, and so forth. 10. Wherefore the sense of sight is likewise a touch, for that the rays touch is evident, from the effect of sneezing excited by solar rays, from the change of state in objects upon which the rays impinge, from their concentration to the extent that they excite heat and fire which melts hard bodies.

420. *Therefore sight is accomplished* by the trajection of light through the cornea across the aqueous humor, then the crystalline and vitreous, into the retina, and from the retina through the optic nerve into the brain. 2. All changes of state

arising from whatever causes, as well the external as the internal, altogether coincide; such is all harmony; for the brain by its fibres rules all things; and because a general sense pervades all the principles of the brain, therefore the affections thence arising are from the whole brain; wherefore they are changes of state that cannot but coincide. 3. The very nexus of the parts and of the tissue are also constructed for that harmony. 4. Similar harmonies also appear in the atmospheres to which also their own affections are ascribed. 5. These harmonies refer themselves to the affections of the brain, but they live, as do sensations, from the life which is in them. 6. To expand these things in particular would be endless, for there is nothing singular of which there are not endless varieties; these varieties many times multiplied with endless varieties constitute endless (indefinita) things.

421. *The arteries of the eye.* 1. There are several branches of the external carotid which enter, as well from the temporal as from the maxillary carotid, according to Winslow. 2. There are also branches from the branches of the internal carotid, which together with the optic nerve are brought to the retina. 3. How the blood purifies the branches of the external carotid of its serum before that blood enters the eye, is evident from many things, as, for instance; 4. this is done by all five branches to the glands, the palate, the nose; 5. especially to the parotid under the ear; 6. by the branches to the lachrymal gland and to the sebaceous glands of the eyelids; 7. by the branches between the plates of the sclerotic themselves; 8. by trajection perpendicularly to the choroid; 9. in the black substance through the little vortices. 10. This to such extent that there may be innumerable steps of purification before they come into the uvea and its apparatus, and about the membrane of the vitreous humor, the texture of which it seems to select and to form [into] septa, which may act as passives. 11. The blood of the internal carotid is sufficiently purified in the brain. 12. It concords entirely with the motion of the brain, as also does the optic nerve, wherefore it flows into the retina, 13. then accordingly with the circulatory motion at the moments of the animation of the brain; wherefore the circulation and the

external vibratory motion in the carotid agree, thus they harmonize in the retina. 14. Wherefore also the veins form the sinus of the orbits, and agree with the sinuses of the brain; 15. which is a sign that the eye enjoys a kind of alternate animatory motion, together with the synchronous motion of the brain, to which the nerves and fibres also contribute. 16. Because the eyes are as it were two succenturiate brains, the internal artery of the carotid flows into the very substance of the optic nerve, which substance is of the brain. 17. All the changes of state of the sensory according to the state of the brain require that the circulation of the blood in the arteries and its animatory motion shall harmonize; 18. but otherwise the motions, as the muscular fibres require one influx of blood, another action of the fibre, in order that they may alternate; 19. therefore the external arteries of the carotid flow into the exterior and interior motor fibres of the eye, 20. and run together about the arterial circle, so that the external and internal changes of state may harmonize into one. 21. How wonderful this is, is to be wondered at. 22. They serve to bind the little sensories, to form the common tunics as the reticular tunic of the retina, perhaps also the tunic of the vitreous lens. 23. Thus they have a passive quality while the papillæ or organs arising from the fibres have an active quality.

422. *The optic nerve.* 1. It is not easy to describe the origins of the fibres of the optic nerve, because on account of the very subtle medullary substance which they bear and pass through, and especially on account of the softness of these fibres the origins cannot be detected by sight. 2. Nor while we treated of the brain could a description conformable to an idea be given. 3. It is evident that the first origins of those nerves appear in the anterior ventricles, where they are called the thalami of the optic nerves, proximately under the corpora striata, where they proceed into the bombycine sinuses (sinus bombycinus), and thence they are reflected through the medullary substance, which Vieussens calls the middle region of the oval centre. 4. But still it can appear that those fibres derive their origin from the cerebrum and indeed not far from the umbones, where the cortical beginnings are in their greatest

expansion, partly also from elsewhere, then also perchance on the way in the thalami themselves, and in the nerves, for Vieussens mentions having seen a kind of cineritious substance interspersed through the nerves themselves; wherefore this is in those thalami partly by way of the corpora striata, in which way the fibres are reflected, partly from the cerebellum, partly from the middle region where they cross that medullary part. 5. This must be confessed, that they communicate with all the medulla of the whole brain, to the extent that there is scarcely a fibre with which they do not communicate, that is to say in the very union of the nerves with all the medulla which descends through the corpus callosum into the base of the fornix, and from this; for their heads incline thither together with the medullary fibre which descends through the corpora striata, then with the fibre which communicates with the isthmus, further by the passages through the medulla of the brain before emerging with the medullary part of the middle oval region. 6. These things are to the end that every modification may pass over to the universal circuit and cortex of the brain, and that there may be a mediate communication with the cortical substance of the sinciput or frontal portion. 7. But we will pass these things by.

423. *In regard to the passage of the optic nerve through the brain these things must be observed:* 1. That from its origin in the ventricles even to its insertion into the orbit and the eye, there is a triple inflection and reflection, altogether into the manner of a spiral; for in the ventricles they are inflected towards the bombycine sinuses, thence they are inflected to a union and from the union again they are inflected, and near the eye they are reflected into a small orb. 2. Thus in order that there may be a spiral which is thin about the eye, but expanded and dilated where it approaches its origins, 3. the purer fibres will to be bent into such a spiral according to their own nature and that of the flux of their spirits. 4. The fibre itself also goes off towards the cortex of the brain into a curve (flexum), to the extent that a perpetual spiral may be manifested in the compound itself. 5. The origins of those things exist in the ventricles, which are alternately expanded and constricted, and

proceed through the medullary substance, all of which things are similarly twisted, to the end that that animatory motion of the brain may be here in like manner intwisted. 6. Thus both the fibres and the vessels which copiously penetrate are established in a flood of motion, and all flow in a most facile potency and kind of natural spontaneity. 7. To these fibres in their beginnings all liberty is conceded; for they are extant in the ventricles, nothing hinders on the part of the cavity but that every transflux of the spirits and of the blood takes place most freely and without constriction. 8. There is such a state everywhere in the beginnings of the brain that all things may be rightly united, may be most free, may play as it were in tender things, may be united, in whatsoever manner nature dictates; the ventricular cavity confers as much as possible to that liberty. 9. Thus provision is made in the best manner for the organ, which approaches proximately to the nature of the brain, and by which the mind is especially to be instructed. 10. But according to custom of that same nature after the abundance of this liberty it is afterwards constricted and compressed into a smaller fascicle, as, for instance, the fornix in the cerebrum, and the peduncle of the cerebellum; and thus it expands itself and binds itself to its own duties; thus all things can be rightly determined; without at first a narrower compression into a fascicle, all determinations would be in ultimates nor would they be limited, but would flow off as outlaws; this is the reason why its medulla is compressed into a more narrow fascicle. 11. Thence all things obey the nod of the brain constituted in its own liberty while in beginnings; and to the boundary and from the boundary they rightly flow to the goal. 12. The origins of the nerves flow from the greatest motion to the least or to rest or to the port when they flow to the eye, the greatest motion is into the ventricle, less into the bombycine sinuses, about the infundibulum, wherefore about the sella turcica, when they are united it is still less, in the orbit least, finally, there is no motion. 13. Wherefore all humors necessary to the eye flow thither spontaneously, and are as it were twisted, thither; but others than those which are due pass by, for the nerve is there compressed into a fascicle. 14. It cannot be wanting from this

reason but that every single fibre, and at the same time, every single little vessel of the internal carotid, which follows [the optic nerve] and penetrates broadly into the eye, according to the experience of Ridley, should be in the animation of the brain, wherefore that the eye itself, especially the retina, is vibrated in such a manner; for with those movements the spirit is poured through the fibres of which it cannot be deprived, while the strength of that animation with so facile potency and curvature extends thither, so that thus on account of this reason the brain seems to have transcribed all its potency into the eyes. 15. Every animation of the brain scatters the spirit about through the fibres, and takes place by the spirit itself thus more interiorly, but every sensation thus takes place through the fibres and tunics thus more exteriorly; wherefore the tunics of the fibres are exposed to the modifications, upon which the rays impinge. The one comes from the prior thus to posterior things downwards, the other from the posterior thus to prior things upward; thence there is a circle from sensation to perception and understanding, from the understanding to the will and thus determination, or from outmosts to inmosts, from inmosts to outmosts. 16. Therefore also the internal carotids follow, for the circulation of their blood agrees with the same movements. 17. Thence the venous blood is drawn off into the sinuses. But we have treated of these things above.

424. *The use of the third pair of nerves, or the common motor nerves of the eye.* 1. When the brain has been formed, it appears that it designs nothing sooner than inducing diverse states upon its eyes, wherefore it covers up all the succeeding nerves, or branches from them, from the second to the seventh pair inclusively; for the eyes are succenturiate brains, and are added as organs proximately for its operations. 2. As soon therefore as the eye is formed, it establishes the states of its motion, for which end it sends forth the third pair, and is separated into four or five filaments, and indeed it sends them forth to four muscles, namely, to the elevator, to the adductor, to the depressor, and to the inferior oblique. 3. Thus it establishes its rotatory motion and its mutations of state, 4. and indeed to those muscles in which the eye especially regards the

brain, for they draw the eye successively and at the same time towards the interiors or towards the nose, altogether as when we think intently, then we are accustomed to draw the eye upward toward the lid and to the nose and to cut off the light from it, so that there may be freedom for the thoughts of the brain, according to the idea of the painted philosopher (*philosophi picti*), so that thus these muscles may subject the eye to the brain but not draw it thence. 4. How it institutes and establishes all these mutations of state, looking to this work, both the external and internal mutations by one nerve can be seen, 5. and indeed so that the states of external motion may concur altogether with the internal, and the former and the latter with the affections of the brain, which are the causes of the mutations. 6. At first it sends forth this its nerve anteriorly from that very region where the motion of the brain ceases and that of the medulla oblongata begins, and mutually concur with each other, wherefore in the ultimate boundary of its sphere, and the first of the sequent medulla, where it is subjected to the motion of the cerebellum, thus in the place of its greatest equilibrium; 7. namely, just above the annular protuberance, where the planum striatum continued from the cerebrum about to enter the medulla oblongata coalesces; it is not far from the first prominences of the infundibulum; 8. and in order that each nerve of the pair may act for one end it comes forth jointly and from one root in united fibres. 9. Thus it participates also in the filaments of the cerebrum and of the cerebellum, for the action of this nerve is natural and voluntary. 10. It runs through also thence to the places of its highest equilibrium, that is to say to the juncture of the two carotids, and to the juncture of the two sinuses of the base, to the sella equina, where it enters the sinus cavernosi, where is situated the center of the os basilare or the sphenoid, 11. thence to the axis of the cranium or to the sphenoid fissure, thus into the orbit. 12. Its first branch goes to the elevator of the eye, which draws the eye up toward the brain, and subjects its sight to the sight of the brain, 13. and in order that the external state of the upper lids may concur, it even sends forth a shoot or frondicula to its muscle, wherefore we see, as in a mirror, that

the upper lid applies itself altogether to the motion of the pupil or eye; the pupil in the circumvolution of the eye is just under the edge of the upper lid (pupillæ?), as has been observed above. 14. Thus it joins the outmost state of motion with the motion of the eye itself. 15. Then with other offshoots it goes to the adductor muscle, another to the depressor, another to the inferior oblique; thus it establishes a motion which turns or disposes the sight of the eye to the sight of the brain, 16. so that now it may unite external motions with internal ones, or that of the uvea itself, of the iris and perhaps of the lentiform with external motions or states, or with the states of external motion, a small branch forms a kind of gangliform lens, and thence sends forth a shoot about the optic nerve, which it encircles, 17. thus the prior external state of the motor of the eye is joined with the motor state of the optic nerve, for that nerve bends itself at the same time as the eye; see Winslow. 18. At the same time also it joins, by means of the optic nerve, the internal states of the eye with the external, which must be done from a new beginning or from a formed little ganglion, for they differ sometimes especially when the will or cerebrum actuates the motions of the eye, not so when nature actuate; 19. wherefore also from that gangliform lens it sends forth fibres or filaments between the sclerotic tunic and the choroid, even to the iris, and into the muscles of the uvea. 20. Thus external states are united with internal ones by means of the optic nerve, 21. the states of each tunic, the sclerotic and the choroid at the same time, and thus the state of the iris and of the pupil, which ought to agree with the state of the optic nerve. 22. Wherefore all the affections of the cerebrum and the cerebellum reflecting upon the optic nerve, whence are the mutations of state. Internal motions and sites altogether harmonize, yea, those of the vitreous humor, of the crystalline lens, of the retina. 23. By means, therefore, of this nerve is established the harmony of all the external and internal states of the eye, and they are accommodated to the affections of the brain, with wonderful wisdom.

425. *The uses of the fourth pair of nerves or of the nerve of the trochlear.* 1. This one in like manner as the former springs from the place of the greatest equilibrium, or from the

place of meeting of the motions of the cerebrum and the cerebellum; 2. but not from the anterior part as the former, but from the posterior part, about the region of the testes, not far from the isthmus, where the first or transverse process of the cerebellum arises; thus respectively to the former pair, the nerve of which is conjoined, but the determination of the one anteriorly, that of the other, however, posteriorly, in the same line where the meeting and equilibrium between both brains holds sway. 3. Thus it seems to receive filaments from both the cerebrum and the cerebellum, and it is subject to the authority of both, or to the will and nature, which also becomes evident from its action. 4. This pair likewise but by a longer way runs forward in both directions near the septum of the meninges and near the side of the annular protuberance, to the sella equina into the sinus cavernosi, between the nerve of the third and the sixth pair. 5. Indeed it runs above the third pair and the rest of the nerves which it touches. 6. This nerve goes to the trochlear muscle or the superior oblique, which is the equilibrator of the four former nerves, to the extent that this one muscle occupies one balance of motion, while the other four occupy the other, thus they correspond to each other; for those four muscles without this trochlear could not be arrested and held back, according to Winslow and others, hence a separate nerve is required which may actuate the other cause, wherefore it runs forth from the opposite side in the medulla oblongata: that the office of this muscle is such may appear manifestly from the application of its motor fibres. 7. And lest the motions of the rest of the muscles should disagree, but that they may be reduced to a unanimous one, in the passages it also imparts filaments to them, so that thus it conjoins itself with the rest of the muscles, in order that there may be a ratio of equilibrium and co-operation to the same end. 8. Perhaps even together with branches of the third and fifth pair conjoined by fibrils it also goes to that gangliform lens, for many filaments inflow into it, and it thus actuates some equilibration and agreement among the external and internal changes of state of the optic nerve and of the pupil, and of the rest of the apparatus in the eye.

Notes and Comments.

A young Men's Swedenborg Club has been recently organized in Washington, D. C., with Dr. John R. Swanton, of the Smithsonian Institution, as president, and Mr. Robert Tafel, of the Magnetic Laboratory of the Carnegie Institution, as secretary. The Club is studying Swedenborg's *Principia* particularly with a view to the subjects of magnetism and electricity. The want is felt anew of a series of diagrams and models giving visual forms, if possible, to the initial units and movements of the spatial world. The contribution made some time ago by Messrs. Stroh and Farrington of the spherules and intermediary substances of the first chemical bodies might profitably be followed up by a series of such illustrations. Which of the several *Principia* or Swedenborg clubs now in active existence will be the first to take up this greatly needed work?

Dr. John R. Swanton, president of the Young Men's Swedenborg Club, of Washington, is president of the American Anthropological Society, devoting himself mainly to ethnological studies. The Smithsonian Institution has recently published in a very handsome quarto volume, his last researches in connection with the vanishing tribes of the North American Indians. It is full of strange and interesting Indian myth, legend and story telling derived at first hand by Dr. Swanton from the lips of aged representatives of the tribes so rapidly passing away.

The erection of the sarcophagus over the remains of Emanuel Swedenborg in the Bjelke chapel of Upsala cathedral and the suitable decorating of the chapel for which the Swedish Government has recently voted an appropriation will be another event to add interest to the year 1910—it being the two hundredth anniversary of the founding of the Scientific Society

in Upsala in which Swedenborg was so active an agent, and the centenary of the founding of the Swedenborg Society in London. Many visitors to the International Swedenborg Congress in London will doubtless desire to attend also the bi-centenary celebration in Upsala, and it is hoped the dates may be such as to make such visits possible.

The president of the Swedenborg Scientific Association has received the following notification from the secretary of the Swedenborg Society of London:

PROPOSED INTERNATIONAL SWEDENBORG CONGRESS, JULY, 1910.

The Committee of the Swedenborg Society intend to bring forward at the annual meeting in June next, a resolution authorizing the celebration of the centenary of the society in July, 1910, by a congress, which shall be, as far as possible, representative of all Institutions and Societies throughout the world which are interested in the circulation of the Scientific, Philosophical or Theological works of Swedenborg.

The plan, so far as it has yet been formulated, is as follows:

1. The Congress to meet on Tuesday, the 5th July, 1910, and to remain in session for four days.
2. The Congress to consist of representatives elected by recognized bodies, whether belonging to the New Church or otherwise, who take an interest in the dissemination of the writings of Swedenborg, and of such other persons as may be invited by the Swedenborg Society. The public to be admitted to the deliberations of the Congress by ticket.
3. The delivery of public lectures and addresses on the relation of Swedenborg's Scientific, Philosophical and Theological teaching to the thought of the day.
4. Religious and social meetings.

The plans of the Society, however, remain for the present open to re-consideration and amendment after correspondence with their friends in other countries. They will be glad to receive suggestions from all who are interested in making the proposed Congress a success, and especially from those who desire that the work of making the writings of Swedenborg

accessible to the whole world, should proceed on a definite and well-thought-out plan, with as little delay as possible, and with the utmost economy of expenditure that the nature of the work permits.

The Committee of the Swedenborg Society will be obliged if you will favor them with any suggestion by which you think the usefulness of the proposed Congress would be increased. It is important that these suggestions should reach them at an early date, as the complete plans will have to be submitted to the Annual Meeting in June next, and will necessarily take some time to prepare.

By order of the Committee,

JAMES SPEIRS,
Secretary.

1 Bloomsbury Street,
London, March 31, 1909.

The above interesting notice will come up for consideration of the Swedenborg Scientific Association at the annual meeting to be held in Philadelphia, May 8, 1909. The event here anticipated appeals to the Association very directly—in many of its important interests—and the manifest usefulness of such a meeting calls for the most cordial response and co-operative effort on the part of all the organizations invited to take part.

SCIENCE KNOWS NO CAUSE.

Alfred Russell Wallace, F. R. S., in an article in the *Fortnightly Review* for March, on "The World of Life as Visualized and Interpreted by Darwinism," after describing in a most interesting manner the wonderful fertility and variety of nature in producing living forms, makes these significant admissions at the end of his article, in which there seems to be a distinct recognition of the law of discrete degrees which assigns to spirit the function of cause and to nature the function of effects and their uses.

He says: "These (the various living forms of nature) have all been brought into existence through the unknown but

supremely marvelous powers of Life in strict relation to the great law of *Usefulness*, which constitutes the fundamental principle of Darwinism.

"Before concluding I must, however, add a few words to avoid misconception. Neither Darwinism nor any other theory in science or philosophy can give more than a secondary explanation of phenomena. Some deeper power or cause always has to be postulated. I have here claimed that the known facts when fully examined and reasoned out, are adequate to explain the method of Organic Evolution: yet the underlying fundamental *causes* are and will probably ever remain not only unknown but even inconceivable by us. The mysterious power we term life . . . will surely never be explained in terms of mere matter and motion.

"Every attempt to explain these phenomena—even Darwin's highly complex and difficult theory of Pangenesis—utterly breaks down. . . . These utterly unavailing efforts to explain the inexplicable, whether in the details of any one living thing, or in the origin of life itself, seem to me to lead us to the irresistible conclusion that beyond and above all terrestrial agencies there is some great source of *energy* and *guidance*, which in unknown ways pervades every form of organized life, and of which we ourselves are the ultimate and fore-ordained outcome." The italics in this passage are in the original.

Dr. Wallace, it may be remembered, was the distinguished authority who pronounced the Root Principles of the late Rev. Thomas Child, of London, the ablest reply that had yet been made to the materialism of Haeckle's Riddle of the Universe.

F. S.

Swedenborg's Scientific and Philosophical Works

Below is a partial list of the works which the Swedenborg Scientific Association has yet to bring out.

I. SCIENTIFIC WRITINGS.

- TREATISE ON IRON.** 386 pages, folio. Untranslated.
- TREATISE ON COPPER.** 534 pages, folio. Translated, but publication delayed for lack of funds.
- THE GENUINE TREATMENT OF METALS:** (1) On Sulphur and Pyrites. (2) On Common Salt. (3) On the Separation of Silver and Copper. (4) On Vitriol. MS. 1481 pages. 4to. These are now being copied from the MSS., and the two former are already finished.
- THE MAGNET.** MS. 299 pages. 4to. Has already been copied from the MS.
- GÉOMETRICAL AND ALGEBRAICAL PAPERS,** in MS. 169 pages. 4to.
- VARIOUS SCIENTIFIC PAPERS,** covering between four and five hundred pages all together, printed in Latin and Swedish, or in MS. A few have been translated but are now out of print.

II. PHILOSOPHICAL WRITINGS.

- THE "LESSER PRINCIPIA."** MS. 560 pages. 4to. Said to be "an indispensable help" to the proper understanding of the "greater Principia" It has been transcribed and a start made in translating.
- A FORE-RUNNER OF THE FIRST PRINCIPLES OF NATURAL THINGS** ("Principles of Chemistry.") 8vo. A sequel to the above. Out of print.
- MISCELLANEOUS OBSERVATIONS CONNECTED WITH THE PHYSICAL SCIENCES.** 146 pages. 8 vo. One section deals with Swedenborg's "corpuscular philosophy." Out of print.
- THE PRINCIPIA.** 2 vols. 8vo. Contains the first published suggestions of the "nebular hypothesis." A new translation, prepared under the auspices of the Association, is now in the press.
- THE ANIMAL KINGDOM.** 2 vols. 8vo. The former translation is now being thoroughly examined preparatory to a new edition.
- THE NERVES.** 366 pages. 4to. Containing Swedenborg's "doctrine of forms." That part on "The Diseases of the Fibres" has been translated and was published serially in *New Church Life*. It is hoped that it may soon appear in book form.
- TREATISES ON THE BRAIN.** Covering upwards of 1,700 pages of MS. Part of this material was published by Dr. Tafel in his compilation entitled "The Brain."
- GENERATION.** 8vo. Out of print.
- DIGEST OF SWAMMERDAM'S "BIBLIA NATURAE",** in MS. 79 pages folio. Contains also comments by Swedenborg.
- SENSE.** Appearing for the first time in English in the pages of this magazine.
- THE WORSHIP AND LOVE OF GOD.** A new edition is soon to appear, including the incomplete third part, which has never before been published.
- A HIEROGLYPHIC KEY TO NATURAL AND SPIRITUAL MYSTERIES.** A fore-runner of the doctrine of correspondences. Out of Print.
- SMALLER PHILOSOPHICAL TREATISES,** covering about 360 MS. pages. Translations are now being published by the Association. See also *New Philosophy* for April, 1905.

NOTICE.

The twelfth annual meeting of the Swedenborg Scientific Association will be held in Philadelphia, on Saturday, May 8, 1909, at Odd Fellows' Temple, Room B, floor 5, corner of Broad and Arch Streets.

9:30 A. M.—Meeting of Board of Directors.

10:00 A. M.—First session of Association.

12:00 M.—Presidential address.

2:30 P. M.—Election of Officers.

In addition to the president's address, papers, and the usual reports, the subject of how best to co-operate with and further the proposed International Swedenborg Congress in London in the year 1910, will be discussed and suitable measures taken.

Persons wishing to present papers or other communications at the meeting will kindly communicate with the secretary.

REGINALD W. BROWN,

Secretary.

THE NEW PHILOSOPHY.

VOL. XII.

JULY, 1909.

No. 3.

FOREWORD.

BY THE EDITOR.

As will be noticed in the Transactions of the Twelfth Annual Meeting of our Association, the former editor of the *New Philosophy*, owing to the pressure of other duties has resigned that office, and the present editor has been elected in his place.

With the election of the new editor there was also an expression of opinion as to the policy to be pursued by the *New Philosophy*. From the very beginning of the organization of our Association there has been a strong desire that the efforts of the Association shall, for some time, be directed primarily to the first of the uses for which it was organized; *i. e.*, for the translation and publication of Swedenborg's Scientific Works. Many of these works, indeed, by far the most of them, are out of print and inaccessible to the ordinary reader, and it was felt that until they were generally circulated and read, little progress could be made by a discussion of their teaching. It was for this reason that since its inception the Association has steadily favored, either directly or indirectly, the translation and publication of Swedenborg. As a result we have many small works by him which have appeared from time to time in the *New Philosophy*, some of them translations from hitherto unpublished manuscripts. And at the present time we are publishing Swedenborg's work,—or, rather, first draft, of the work—on the Senses.

During the past year or two, however, it has been felt by many that the few pages of the journal devoted to transla-

tions were not enough, and that the greater part of the journal might profitably be given over to this use. It was this feeling that induced one of our directors to write to the Board—as reported in the Transactions—“expressing regret that more space in the *New Philosophy* was not devoted ‘to translations from Swedenborg’s unpublished works.’” Mr. Chandler’s letter was favorably reported by the Board and in the discussion upon it in the meeting of the Association it was unanimously decided to recommend its suggestions to the favorable consideration of the editor of the *New Philosophy*.

The editor is himself so heartily in accord with Mr. Chandler that he will feel no difficulty in following this recommendation. But it might be well to state that this does not mean that the *New Philosophy* will not print such articles as make for advance in the study and understanding of Swedenborg’s philosophy. It means no more than that the *main* contents of the journal will ordinarily consist of translations of Swedenborg’s own works.

A difficulty presents itself at the outset, in the very limited number of pages which are printed during the year. Thirty-two pages four times a year make one hundred and twenty-eight pages; from this number, at least, thirty-two pages must be deducted for the Transactions, reports, editorial notes, etc. This leaves, less than a hundred pages of translation during the year! hardly enough to publish a considerable installment of any of the larger works.

What is the remedy? As it appears to the writer the first remedy is to endeavor by the securing of more members of the Association and subscribers to the journal, to make it possible to increase the latter first by eight and then by sixteen pages; and, when our subscription list justifies the step, to publish it every two months.

Is it possible to do this? The outlook certainly is not encouraging, that is, if we judge from the last annual report of

the Treasurer. We are told that there has been, during the past year, "A FALLING OFF OF 34 PER CENT. IN DUES AND 33 PER CENT. IN SUBSCRIPTIONS TO THE NEW PHILOSOPHY," as compared with the previous year. This does not mean that the membership has decreased by 34 per cent., but simply that 34 per cent. have not paid their dues, and many of them, if the dues remain unpaid, will automatically lapse from membership. The actual decrease in membership is about 8 per cent.

In this connection we would call the attention of our readers to another discouraging fact brought out in the Treasurer's report, namely, that *seventy-one of our members are in arrears for dues, and ninety-five subscribers to the New Philosophy are in arrears for their subscription*,—the total amount of money due the Association under these two heads, being \$165.00. Surely this is a lamentable state of affairs; and it is not made more bright by the reflection that the number of persons in arrears constitutes nearly forty per cent. of our membership and over forty per cent. of our subscribers.

What is the cause of this? It is, perhaps, impossible to give the individual causes, but it seems certain that one of the generic causes is apathy—an apathy which, with some produces absolute neglect and with others a too easy forgetfulness as to the duties of members. But whatever the cause, it behooves us to do all we can to excite interest in our work, to show its importance to the growth of the New Church and to the formation of rational philosophical thought, and thus to induce others to support the work. For this the Association must rely largely on its individual members. Let them speak of the work to their friends, and—at all events—see to it that their own co-operation is not wanting. A large number (if not all) of the arrears due the Association is probably due merely to neglect and forgetfulness, but—the work of the Association suffers none the less.

It is to be hoped that the increased space that will in future

be given to translation will serve to increase and renew interest in our work. And this leads us to the question of what shall be published. The Senses will, of course, be continued, and The Fibre has been spoken. But there will frequently be room to print some of the smaller works, and the editor would be glad to receive suggestions as to what the readers would like to see.

The discussions at the annual meeting brought forth the suggestion that as sixteen pages of any translation are completed they be struck off and be kept for binding. This will also give all who may desire it an opportunity of purchasing these sixteen pages as they are printed and keeping them for their own use until completed, when they can be bound. The cost of the pages will be very slight. More will be said on this matter in a future issue. But we might add, that sixty-four pages of The Senses will be printed in a very short time, if, indeed, it is not done before these words reach the eye of the reader.

AN IMPORTANT OFFER.

In reflecting as to what works might be translated for the *New Philosophy*, the thought of the editor continually reverted to the Work on Generation. This is one of the most important of Swedenborg's works and deals with a vital subject. And yet it is so rare as to be out of reach by all except those who are fortunate enough to possess a copy, and its wonderful contents are almost unknown.

But some objections to publishing this work in the *New Philosophy* readily occur, not the least of them being, perhaps, the necessity there would be of sometimes giving as a whole installment, nothing but quotations from the anatomists. In a book these are important and interesting, but, coming as a complete installment and without Swedenborg's Inductions they are hardly calculated to keep up the interest of those who are desirous to read Swedenborg himself and who must wait for three long months.

Talking this matter over with some of the members of the Association, one of them, Dr. F. A. Boericke, who is a publisher, made what we must consider a most generous offer, namely, that IF THE EDITOR OF THE NEW PHILOSOPHY WILL SECURE ONE HUNDRED SUBSCRIPTIONS AT THREE DOLLARS EACH, HE WOULD PUBLISH THE WORK "ON GENERATION." We lay this offer before our readers as one that should not be neglected. It is not often that the Association has such an opportunity, and—and this is a matter of considerable importance—it should also be remembered, that this publication may be the means of republishing others of Swedenborg's writings through the same channel.

While the generous offer of our vice-president requires us to secure one hundred subscriptions, yet experience dictates that, in view of such contingencies as death, the failure of means, or the falling off of enthusiasm, this number should be increased by twenty-five per cent. to afford a safe margin. As to the editorship of the work it will be entrusted to competent hands, and will consist in a complete revision of the translation.

The offer is thus presented to our readers and is now left in their hands. What will you do with it? What you *can* do with it, is, subscribe for yourselves and *speak about the matter to others*. The question is, Is there a desire to have the work published? And then, Is that desire strong enough to produce adequate response to this offer? If the desire is strong enough there is no doubt that the work can be published. And we might add that there is no reason why those who feel disposed to do so, should not subscribe for several copies which might be presented to Societies, libraries and friends. The work can probably be issued and placed on the market within a year of the time when the required number of subscriptions is received. Subscriptions with or without remittances, should be sent to The Editor of the *New Philosophy* at Bryn Athyn, Pa. Checks or money orders should be made payable to Alfred Acton.

TRANSACTIONS
OF THE
TWELFTH ANNUAL MEETING
OF THE
SWEDENBORG SCIENTIFIC ASSOCIATION.

The Twelfth Annual Meeting of the Swedenborg Scientific Association was held at Odd Fellows' Temple, in the City of Philadelphia, on Saturday, May 8, 1909.

FIRST SESSION.

1. The meeting was called to order by President Sewall, at 10:15 A. M.

2. On motion the minutes of the Eleventh Annual Meeting were approved, as printed in the *New Philosophy* for July, 1908, and the reading of them was dispensed with.

3. The Chair appointed the Rev. J. B. Spiers and Mr. Emil Stroh a Committee on the Roll. The Committee reported the following members and visitors in attendance:

Members: Dr. Frank Sewall, Dr. F. A. Boericke, Rev. Reginald W. Brown, Rev. C. E. Doering, Dr. Geo. M. Cooper, Rev. Alfred Acton, Mr. L. E. Gyllenhaal, Miss M. C. Hogan, Mr. John Pitcairn, Rev. J. B. Spiers, Mr. E. F. Stroh, Rev. H. Synnestvedt, Mr. A. L. Tafel.

Visitors: Rev. W. H. Alden, Mrs. C. E. Doering, Miss M. Doering, Miss S. Falk, Miss A. E. Grant, Miss C. L. Grant, Mr. Raymond Pitcairn, Rev. E. S. Price.

4. The Treasurer presented his financial statement, as printed on p. 72, and explained that there had been a falling off of 34 per cent. in dues and 33 per cent. in subscriptions to the *New Philosophy* as compared with the previous year.

5. The Chair appointed the Rev. Homer Synnestvedt and Dr. Boericke a Committee to Audit the Treasurer's Statement. The Committee later reported that it found the statement to be correct.

6. The Board of Directors reported three meetings during the fiscal year, as follows :

The *first* held on May 27, 1908, immediately after the adjournment of the Annual Meeting of the Association. At this meeting officers were elected and Dr. E. A. Farrington was appointed Editor of the *New Philosophy*. A recommendation to the Board that the Treasurer be empowered to issue a call for subscriptions to a new edition of Swedenborg's *Posthumous Tracts* was laid on the table. Mr. A. H. Stroh's request that the Association meet the expense of publishing the *Festivus Applausus* was referred to the Treasurer with full power to act when sufficient information be received to justify action.

The *second* meeting was held in Philadelphia on Oct. 19, 1908. A report from Mr. A. H. Stroh was read, setting forth the fact that the Swedenborg Society of London had expressed the desire to co-operate to the fullest extent possible in furtherance and support of his work in Sweden, and that he had endorsed and provisionally agreed to a series of proposals to this end enacted by the Society, among which was the promise of an annual subscription of \$500.00 toward his support.

It was resolved to communicate to Mr. Stroh the Board's hearty approval of the arrangement made by him with the Swedenborg Society. It was further resolved to send Mr. Stroh's report to the General Council of the Convention with the recommendation that they agree to contribute the whole of the \$500.00 provisionally appropriated by Convention at its Annual Meeting, the Academy having already agreed to subscribe the same amount.

The Secretary was instructed to communicate to Mr. Stroh the urgent request of the Board that he do all in his power to promote the translation of the *Worship and Love of God* and get it into the hands of the printer.

Several points presented by Mr. Acton in his Annual report as Chairman of the Committee on Publication of Swedenborg's Scientific MSS. were discussed. The Board agreed that an historical preface, such as Mr. Acton suggested in his report, might be useful. The Board also agreed that in view of the work being done by the Royal Academy of Sciences in Sweden the Association might relinquish, for the present, the further publication of the Scientific MSS.

The Board was of the opinion that as 50 copies of the new edition of Swedenborg's works now being published in Stockholm have been subscribed for in this country, the various Book Rooms might be appealed to, to each subscribe for several copies; it was agreed that these bodies be approached by the president.

The *third* meeting of the Board was held in Philadelphia on May 8, 1909. The question of undertaking the expense of the *Festivus Applausus* having been referred back to the Board, it was resolved that,

since the paper is not of a scientific character and at the same time is one in which the Swedish nation might have a peculiar interest Mr. Stroh be recommended to endeavor to enlist the co-operation of some Swedish body in its publication.

The Board also approved of an earnest recommendation received from Director Chandler that more space in the *New Philosophy* be devoted to translations from Swedenborg's unpublished works.

Mr. Doering, Chairman of the Committee on a New Edition of the Animal Kingdom, reported favorably on the translation made by Dr. Wilkinson and published by the London Swedenborg Society, and it was decided to make an earnest appeal to the Swedenborg Society to republish their own edition.

Mr. Price reports that about twenty-five pages, more than half the Latin edition of *De Sensibus* has been translated.

Dr. Farrington tenders his regret that pressure of other duties have greatly interfered with his editorial work and he presents his resignation as Editor of the *New Philosophy*.

Mr. Acton reports the completion of the printing of *De Sale*, and that the work only awaits the printing of the Index and Preface, and some *Nota Critica*.

7. A letter from Mr. Chandler was read, stating that the Rotch Trustees had not yet received the remainder of the translation of the *Worship and Love of God*. Mr. Chandler also expressed his regret that more space in the *New Philosophy* was not devoted "to translations from Swedenborg's unpublished works," as reported by the Board.

8. Communications from Mr. R. A. Shaw, Rev. H. Clinton Hay, and Prof. Hite were also read, the last regretting that he had not been able to be present to read a paper promised for the occasion.

9. Dr. Sewall reported on behalf of the Committee on Mr. Stroh's Support that the Committee had approached The London Swedenborg Society, the General Convention, and the Academy and that each body had subscribed \$500.00 for the past fiscal year. He also recommended that a similar committee be appointed to solicit a continuance of his support during the coming year.

10. A Report from Mr. Stroh, outlining the work that he has been connected with during the past year, was read. (See p. 92.)

11. A copy of Mr. Stroh's compilation, "*Nagra Vittnesbord om Vetenskapomannen Swedenborg*," which was distributed to all the members of the Swedish Parliament in connection with the vote on the appropriation to provide a sarcophagus for Swedenborg's remains was presented to the Association.

12. The Chair informed the meeting that he had received contributions more than sufficient to cover the expense of the wreath provided by Mr. Stroh on behalf of the New Church in this country in commemoration of the removal of Swedenborg's remains to Sweden.

13. It was *Resolved*, That in accordance with the recommendation of the Committee on Mr. Stroh's Support, the President and Mr. Doering act as a Committee to present to the General Convention and to the Academy an appeal to continue their support of Mr. Stroh, and that this appeal shall be made in such form as the Committee may deem most suitable.

14. The attention of the meeting was called to the fact that Mr. Stroh was being supported in Sweden for the purpose of publishing Swedenborg's works, and it was the opinion of the Association that we ought to urge Mr. Stroh not to sacrifice this purpose by allowing himself to be absorbed by other interests. The Secretary was, therefore, instructed to communicate to Mr. Stroh the following message:

The Swedenborg Scientific Association realizes that circumstances have greatly diverted your attention from the work originally contemplated in sending you to Sweden, namely, the publication of Swedenborg's works. The Association appreciates that the diversion on your part has been in the interest of its central purpose, but it thinks it desirable that the original work be now resumed as your central work, and be prosecuted with its former vigor.

15. On motion it was decided that the time and mode of publication of Mr. Stroh's report be left entirely to the editor of the *New Philosophy*.

16. On motion the election of officers was made the first order of business of the afternoon session.

17. At 12 M. the President delivered an address on "The

Purest Parts of Nature." Mr. Acton expressed his appreciation of the address, suggesting that a time be appointed to discuss it during the afternoon, as it touched on subjects which have been active in the minds of so many.

18. The President outlined the order of business for the afternoon and the meeting adjourned to reconvene at 2:30 P. M.

SECOND SESSION.

19. The meeting was called to order by President Sewall at 2:30 P. M.

20. The Report and Resignation of Dr. E. A. Farrington as editor of the *New Philosophy*, were read.

21. The following gentlemen were elected officers for the coming year:

President: Rev. Frank Sewall, A. M., D. D.

Directors: Dr. F. A. Boericke, Horace P. Chandler, Charles E. Doering, Reginald W. Brown, H. Clinton Hay, and Alfred Acton.

22. A letter from Mr. James Speirs on behalf of the London Swedenborg Society, being an invitation to co-operate in a Proposed International Swedenborg Congress to be held in London in 1910, was read.

23. It was resolved that the Secretary be instructed to communicate to the London Swedenborg Society the fact that the Swedenborg Scientific Association has listened with pleasure to their letter inviting this Association to co-operate in the celebration of the Proposed International Congress in 1910, and that the Association is desirous of promoting the purposes of this Congress, and looks forward to being officially represented at its meetings.

24. Mr. Chandler's recommendation that more space in the *New Philosophy* be devoted to translations of Swedenborg's works was taken up. The recommendation was warmly seconded by Messrs. Alden, Sewall, Pitcairn and Acton. The President reported an offer made by the latter gentlemen to translate the work on *The Fibre*, for serial publication.

26. Mr. Pitcairn, after speaking of the desirability of having all Swedenborg's works made accessible to English readers, moved that Mr. Acton's offer be accepted and that space for more translations of Swedenborg be given in the *New Philosophy*.

27. Mr. Acton suggested that it might be well to publish several translations simultaneously, and that these might be of different character, as, for instance, Cosmological and Anatomical; also that installments of each of the works might be sold from time to time in pamphlet form.

28. After further favorable discussion the motion was carried.

29. It was resolved that the question of reprinting in pamphlet form such translations as have appeared in the *New Philosophy* be referred to the Board of Directors.

30. It was resolved that the President of the Association approach the London Swedenborg Society, the American Board of Publication and other Swedenborg publishing societies, urging the reprinting of the *Animal Kingdom*.

31. It was resolved that the Committees on Translation and Revision be referred to the Board for revision.

32. A paper by Mr. Alfred Stroh—The Outlines of Swedenborg's Early Life with a brief account of the Origin and First Development of his Philosophy—was read by the Secretary.

33. It was resolved that the meeting had heard with pleasure the paper of Mr. Stroh and that its disposal be referred to the Board of Directors.

34. The President's address was then taken up and discussed by Messrs. Acton, Pitcairn, Spiers, Synnestvedt and Sewall.

35. The meeting adjourned at 5:30 P. M.

FINANCIAL STATEMENT.

April 30, 1909.

RECEIPTS.

Balance on hand as per last report,	\$295 34
Membership Dues,	\$142 00
Subscriptions to New Philosophy,	96 24
Contributions,	50
	<hr/>
	238 74
Sale of S. S. A. publications: 14 Summary of the Prin- cipia; 26 Fascicle Part 1, 2-Pt. 1-2, 8-Pt. 2-1; 3 Catalogues,	17 55
	<hr/>
	256 29
Total,	<hr/>
	\$551 63

EXPENDITURES.

Printing New Philosophy, Apr.-Jan.,	\$158 10
Paper for New Philosophy,	13 50
Cover paper for New Philosophy,	9 00
Envelopes for New Philosophy,	3 00
Addressing envelopes, four issues,	4 00
	<hr/>
	\$187 60
Sundries,	1 35
Reprint President's Annual Address,	2 75
Reprint Mr. A. H. Stroh's Report,	2 25
	<hr/>
	193 95
Balance,	<hr/>
	\$357 68

SWEDENBORG MSS. ACCOUNT.

Balance as per last report,	4 31
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PLATES FOR ROYAL ACADEMY PUBLICATIONS.

Balance as per last report,	2 00
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ROYAL ACADEMY PUBLICATIONS.

Subscriptions received,	18 00
Amount forwarded to R. S. Academy,	18 00
	<hr/>
	0 00

WORSHIP AND LOVE OF GOD ACCOUNT.

Balance as per last report,	11 60
Balance as per cash book, April 30, 1909,	<hr/>
	\$375 56

RECAPITULATION.

RECEIPTS.

Total balance as per last report,	\$313 25	
Dues, subscriptions to New Philosophy, etc.,	256 29	
Subscriptions to R. S. A. Publications,	18 00	
	<hr/>	587 54

EXPENDITURES.

New Philosophy, etc.,	\$193 95	
Royal Swedish Academy subscriptions,	18 00	
	<hr/>	211 95
Total balance,		\$375 59

SUBSCRIBERS TO THE "NEW PHILOSOPHY."

Total May 27, 1908,	247	
New subscribers,	6	
	<hr/>	253.
Dropped by request,	16	
Dropped; no attention to notices,	8	
Deceased,	2	
	<hr/>	26
Present list paying subscribers,		227
Free, 56; Exchanges, 15.		

ACCOUNTS DUE.

71 members owe for dues,	\$85 00
95 subscribers in arrears, owe	80 00
	<hr/>
Total outstanding for dues and subscriptions . . .	\$165 00

C. E. DOERING,
Treasurer.

Audited and found correct this 8th day of May, 1909.

Signed HOMER SYNNESTVEDT,
F. A. BOERICKE.

MEMBERSHIP.

Total membership reported May 27, 1908,	202	
New members,	4	
	<hr/>	206
Members resigned,	11	
Membership lapsed,	6	
Members deceased,	1	
	<hr/>	18
Present membership,		188

C. E. DOERING,
Treasurer.

NEW MEMBERS RECEIVED DURING THE YEAR.

Deltenre, L'Avocat, Ernst, 40 Rue de Waterloo, Antwerp, Belgium.
Hanna, A. C., 532 2d Ave., San Francisco, Cal.
Sperry, Paul, 129 W. Elm St., Brockton, Mass.
Vrooman, Rev. Hiram, Trinity Square, Providence, R. I. (Renewal).

MEMBERS RESIGNED.

Bennett, John, Mogadore, Ohio.
Carswell, Miss Roberta, 969 W. 32d St., Los Angeles, Cal.
Collom, Rev. J. E., 1126 Maple Ave., Los Angeles, Cal.
Dibert, W. S., Denver, Colo.
Glenn, Gerald S., Bryn Athyn, Pa.
Houghton, Dr. H. L., 56 Bay State Rd., Boston, Mass.
Kinmont, Miss Eleanor, Glendale, Ohio.
Klein, Rev. David H., Glenview, Ill.
Ropes, Miss Mary M., Lincoln, Mass.
Stockwell, Rev. John W., 130 E. 46th St., Chicago, Ill.
Woodward, Dr. H. Wells, 1318 Mass. Ave., Washington, D. C.

MEMBERS LAPSED.

(Minute 16c.)

Bellinger, Peter, 226 Dunn Ave., Toronto, Ont., Can.
German, E. S., Harrisburg, Pa.
McLaughlin, S., 450 E. 10th St., Los Angeles, Cal.
Mackenzie, John, 909 E. 18th St., Minneapolis, Minn.
Smyth, L. S., 3 West 29th St., New York, N. Y.
Van Buskirk, Mrs. V., Peoria, Ill.

MEMBER DECEASED.

Peters, Mrs. B., 83 Lee Ave., Brooklyn, N. Y.

SWEDENBORG'S DOCTRINE OF "THE PURER PARTS OF NATURE."*

BY FRANK SEWALL, A. M., D. D.

I. TWO PRESENT-DAY PROBLEMS.

The present status of natural science is remarkable on account of the contrast it presents in the tendencies of the two orders, respectively, of the physical and the psychological investigations. While the physicists seem to aim at eliminating as far as possible the encumbrances of mass and figure and weight in getting, if possible, at the inmost or purest part or form of natural substance, and to a knowledge of life itself—the psychologist, who has formally allied himself with the physical scientist, is not content until he has abolished every vestige of the soul out of psychology and reduced his subject to a pure matter of chemical mechanism. This trend of psychology is nowhere more manifest than in some of those very applications intended to emphasize especially the action of "mind over body." The phenomenal growth of this order of investigation whether for the purpose of the treating of disease or of ascertaining the nature of a possible mind, a spirit world and of a life of the spirit continuing after separation from the body would seem to indicate the inauguration of a new science, to discover a name for which is one of the problems of the hour. In the U. S. War Department Catalogue of Works in the Medical and Surgical Library under the heading *Psychotherapy*, I find no less than 232 titles of books and of magazine articles by writers of all nationalities treating of this phase alone of the relation of mind to matter.

II. PSYCHOLOGY'S ELIMINATION OF "THE SOUL."

The absence on the part of many of these writers of any acknowledgment of the soul as a distinct substance or entity

*The President's Address to the Swedenborg Scientific Association at its annual meeting for 1909.

apart from matter, even though they treat of the relation as a dual one, reveals the intensity of the present day research into what we must call, with Swedenborg, the purer parts of nature, or those which lie nearest to the spiritual and are the containant of this (*D. P.* 220).

The purely physical character of much of the present day so-called psychology is manifest from the difficulty felt in applying this old fashioned term of soul to that in which the effort is to exclude the soul as a factor altogether. This difficulty is bluntly acknowledged as well as heroically overcome by Karl Lange, who, arguing against the hypothesis of a soul, confesses "the strangeness of a science that doubts whether it has any object at all;" and yet he would regard the setting aside of the old traditional term psychology for such a reason as mere pedantry. "Just calmly assume," he says, "psychology without a soul and the name will still be found useful." (Quoted in J. McBride Sterritt's address on the Proper Application of Psychology, in *Psychological Review*, March, 1909, p. 102.) While Dr. Sterrett in his address before the Southern Society for Philosophy and Psychology in Baltimore, December, 1908, inclines to the title—*Psycho-Psychology*, as properly distinguishing the science that retains the soul proper as its subject, he admits also the propriety of the term *hypo-psychics* to designate the *science that treats of those substances and forms in the body which exhibit the apparent play and forces of soul or conscious subject*. If these purer and subtler parts of our organism are not strictly the soul they lie *immediately beneath, and most adjacent to the soul*, and hence may be called hypo-psychic. It is of these parts of nature and of the human body that Swedenborg treats very fully and minutely in the opening chapters of his work on the *Soul*, or *Rational Psychology*. This treatise constitutes a complete system of Physiological Psychology. It forms a proper sequence to those treatises of Swedenborg in the *Principia* in which the purest or inmost forms and substances of nature are handled in their relation to the mechanics of the physical universe. The treatment of the "first finite" in the evolution of

the universe is almost identical in its logical order with that of the "simple fibre" in the formation of the body—in both cases it is the purest part of nature that is being handled and that which lies nearest to the spirit,—whether this spirit be the "Infinite" of *The Principia* or the "Pure Intellect" of *The Soul*. The relation is always that of contiguity; of *lying near*; never of continuity or the fusion into one. This discreteness of degree between the natural and the spiritual constituting a dualism, with its accompanying doctrine of correspondence and influx, is what disappears in the modern or soulless psychology and leaves the plane of operation wholly within the bounds of nature. This is true both of the theories regarding telepathy put forth by the Society for Psychic Research and those regarding Psychotherapy or mind-healing put forward by the Christian Science and the so-called Emmanuel Movement. Both eliminate the spiritual as a distinct essence above or beyond the material. This is evident from the fact that the Psychic Research discusses mind-communication without any prior acceptance of a distinct spiritual world and life—leaving this to be proved *as it may or may not be*; while the preponderance of the body and its welfare in this world over distinctly spiritual interests is what chiefly occupies "Christian Science;" and Dr. Worcester, the author of the Emmanuel Movement, in his book on Religion and Medicine, distinctly rejects the spiritual element in disease in his interpretation of the demoniac obsessions of the Gospel as merely a locally prevalent form of bodily disease which the superstition and ignorance of that time attributed to the influence of evil spirits; thus making even the testimony of our Lord and the evangelists give way to the materialistic monism of the modern Psychologists.

THE SCIENTIST'S ASSERTION OF LIFE.

Meanwhile by the side of this elimination of the soul by Psychologists we see a constantly growing assertion of life and the spirit by the natural scientists, as being, if not the sole real essence of the world, then, at least, its forming and con-

trolling principle. Thus Alfred Russell Wallace in a recent article on Darwinism has declared that while science may discover and describe the infinite productivity and variability of natural species, yet it must stop with this description, unable, as it is, to penetrate into the realm of causes and say *why* nature is so created—in other words, to discuss the *ends* of creation; and so must fall back upon the only solution,—that of an intelligent and benevolent Creator. Professor Robert Kennedy Duncan, of the University of Kansas, in an article in *Harper's* for May, 1909, on the *Chemical Interpretation of Life*, is still more definite and positive in his assertion of the discrete degree between the two orders of life, the natural and the spiritual, and of the reality of the latter.

"Wherever we look (he says) at a point in all the vast expanse of the special properties of 'living' matter, that point resolves itself into a chemical mechanism and nothing else . . . the power in animal or in plant to respond to stimuli is a function not of *Life*, but of matter." It is no "vital" force. In the same way, he asserts that energy, and the various processes of metabolism, in the human system are all explainable by the theory of chemical mechanics; and finally he ventures the prophecy that "with the ever growing establishment of the fact that biology is nothing but a branch of chemistry, it is not forbidden us to imagine that ultimately in the far future it may be possible through a new science—Chemical Psychology—to correlate the *chemical processes of nervous action* with the psychic processes of a spiritual being enveloping them."*

It is here we would suggest that Swedenborg's doctrine of

*The chemical potentials may be regarded not unlike potentialities of an individual as definite intensities which set things going and as such their *close relationship to the surface energies* and surface tensions of biological science is obvious. As to the ultimate nature of the *forces bound up with these potentials*, whether due in the last analysis to electronic stresses or relational stresses in the ether simply, we know little or nothing." [Italics, F. S.] From Article in *Popular Science Monthly* for May, 1909, on "Joshua Willard Gibbs and his Relation to Modern Science," by Dr. Fielding N. Garrison.

the purer things of nature lying next to the spiritual may be of the greatest service not only in arriving at the true chemical psychology—and this at no distant future—but especially in apprehending the nature of that most real spiritual essence which alone contributes the "vitality" and the "vital" force which science searches for in vain.

It is on this plane of hypo-psychic being or of the "purest parts of nature" that the science of today is so deeply interested, the psychologists aiming to eliminate the soul—the physicists rather to assert the soul, even in confessing their inability to touch it. It is in this plane that Swedenborg leads us into a realm of wonderful insights and constructive principles which I shall endeavor to point out.

IV. MENTAL HEALING AND IMMORTALITY.

These principles relate on their practical side as touching the present-day enquiry, to the nature of disease and the process of mental healing;—and to the question of immortality or what it is of us that survives after death.

V. THE ORIGIN OF DISEASE.

In regard to disease and the general subject of psychotherapy, very much light is obtained from Swedenborg's doctrine of man in a *State of Integrity* as described in the Introduction to the *Principia*—where the human body is described as an organism responsive, on the one hand, to the inflowing of Life from the Divine, and on the other, to the subtle influence of nature whereby, in a perfect harmony and delight, the finite in human life experiences its utmost well-being. The obstruction to this harmonious inflow and meeting of the two forces,—the Divine from above, the natural from around,—is caused by the subtlest of the fibres or nerve forms being disturbed by inordinate passions and cravings and their indulgence; hence arises disease and this in forms which may be transmitted through heredity and may continue, even in natures comparatively innocent of these initiative causes.

VI. EVOLUTION AND INFLUX.

The influx of life through recipient forms in their successive order is wonderfully portrayed, in relation to the human organism, in the description of the series of forms in the treatise on *The Fibre*, in the *Animal Kingdom* and in the *Worship and Love of God*. The survey is all-comprehensive; nothing is left out, from the inmost Divine as the source, to the ultimates of nature as the receptacle and respondent. Speaking of the soul's expression of itself in the countenance as illustrating this control of fibrous-force by the spirit, Swedenborg says—"All these things refer themselves to fibres: for what is done in the fibres imbues the countenance and unfolds itself in that order in which it exists in the beginning of the fibres, viz.: in the life of the Supreme from inmost principles: celestial life or the life of His love from principles proximate to them: also mediating or natural life; finally nature herself who carries that order in herself in effigy; thus according to the series of the folding together of the fibre and of the involution of its principles. Hence it is evident how, according to that order, prior things involve themselves in posterior and again evolve themselves from these latter . . . thus in what manner they institute their circulation from firsts to lasts and from lasts to firsts. Thus, and not otherwise, the circle foreseen from eternity and established at the first creation is perfected." (See *W. L. G.* Nos. 95-100 for illustration from the *Nerve*, of the order of the Influx of Life and of the Nerve reactions.) In this—Swedenborg's doctrine of evolution from prior involution—is to be found the whole principle of the relation of life to its environment, and hence active and reactive force between mind and nature.

In this study of the fibre alone we find the same order of involution and evolution of life as we find in the development of the first finite and its successors in the cosmogony of the *Principia*. The student finds himself in both instances in the same vast and varied realm of the "purest things of nature lying next to the spiritual" and also containing the spiritual;

and, rich and inexhaustible as is the field of definiteness of these mysterious invisible intangible forms of life, we are never allowed to lose sight of the superior importance and reality of the Life itself in its Supreme source.

The therapeutic aspect of this subject of forms recipient of life is shown in Swedenborg's statement (*A. C.* 5726) that "evil closes the smallest and quite invisible vessels of which the next greater ones which are also invisible are composed: for the smallest and quite invisible vessels are continued from man's interior. Hence the first and inmost obstruction and hence the first and inmost vitiation of the blood. This vitiation when it increases causes disease and at last death. But if man had lived the life of the good his interiors would be open to heaven and through heaven to the Lord, then also the smallest and most invisible little vessels. . . . Hence man would be without disease and would only decrease to the last of old age . . . and when the body could no longer minister to its internal man or spirit it would pass without disease out of his earthly body into a body such as the angels have. . . ."

VII. IMMORTALITY.

And this brings us to the consideration of the bearing of Swedenborg's doctrine of the Purer Parts of Nature on the soul's immortality and the constitution of the spiritual body—or the body which the soul or mind of man wears after death, in the spiritual world.

For it is in just this connection that Swedenborg in several places in his theological writings refers to the purer parts of nature as in some way or in some sense forming a part of man's body in the spiritual world and we naturally look to Swedenborg's own analysis of nature and gradation of its parts. This analysis we find not only in the physical discussions of the earlier works but also in the psychic or spiritual doctrines of the later period and the correlation of these statements ought to enable us to arrive at a somewhat definite knowledge both of what nature is in its purer parts and of

what the spiritual or immortal body of man is as to its exterior parts: for as, in the passages quoted above, Swedenborg speaks of the purer parts as lying next to the spiritual and as being retained by man when he dies and then forming a *containing* of the spiritual." [D. P. 220.] *Crassiora naturae homo primum induit, ejus corpus ex illis est; sed haec per mortem exiit, ac retinet puriora naturae quae proxime spiritualibus sunt; et haec sunt tunc ejus continentia.*

The subject may therefore be viewed on its two sides: on the physical as reaching up to proximity with the spiritual through what we may call the hypo-psychic stages of life and sense, and on the spiritual side as tending downward or outwards into its touch with the hypo-psychic element—in either case to be found in the purer parts of nature.

If we view the subject on its physical side we will best consult those discussions in the *Principia*, in the *Regnum Animale* and the *De Cultu et Amore Dei* which treats explicitly of the evolution and gradation of forms proceeding from the celestial, or those which are above nature, into those which are of nature. This subject has already been briefly treated of in the Annual Address before the Association for the year 1905, where Swedenborg is quoted as saying "If the reader could speak of the soul as comparable to a machine I have no objection to responding in the same tone; only I cannot allow the comparison with inanimate but with animate machines." [New Philosophy, July, 1905.] In the same way we may interpret Professor Duncan's doctrine of the Mechanics of Chemistry, surrounded and actuated by spiritual forces as constituting an ensouled mechanism or a mechanism demanding a supernatural as well as a natural accounting; for, as exhibiting truly the phenomena of life. An extraordinary statement of this idea of the Divinely animated mechanism appears in the *Worship and Love of God*, No. 69. "The nature itself of the world is void of life, made only to be subservient to spiritual essences or living minds as an instrumental or organic cause; for there is nothing in the universe but what tends to their use, . . . all spiritual essence and all living

minds are nothing but mediators of life and thus again instrumental causes; consequently the whole is a machine of mediations that the Love of the Supreme might be all in all and by it celestial things be joined with terrestrial."

The succession of "Forms or Substances in the greatest and in our least universe" is thus described in no. 93 of the same work: The order first given is *a priori* or that of the involution of higher forms and substances in the lower.

VII. THE DESCENT AND ASCENT FORMS.

"These forms," says Swedenborg, "which are actual substances and by changes of state perform their wonderful functions in the world, when subordinated to each other, are circumstanced as follows:

I. The first form of all proper to our soul is called super-celestial; the second, that of the intellectual mind (*mens*) is called infra-celestial. To these now succeed forms purely natural which, named from the fluxion, would be *First*, the Spiral, seen in the corporeal fibres themselves; *Second*, the circular or spherical, seen in the blood vessels; *Third*, angular properly terrestrial and material serving the fluids and the blood itself and also the *spirit of the fibres*, for corporeity—that is, to give these a body. But what the quality of the nature of each form is must be learned from what is evident to the understanding by and of the senses—consequently from the last or from the angular and spherical form.

I. The Angular from the mutual'opposition of its essentials is heavy inert matter unadapted to motion.

II. The Spherical is more perfect, its surfaces resembling an infinite angle regarding only one fixed point as its center, and so accommodated to motion and varieties of form.

III. The third or Spiral is more perfect, putting on a kind of perpetuity or infinity . . . thus still more accommodated to motion and variations.

IV. The fourth or Infra-celestial derives a higher perfection from a kind of new perpetuity—or infinity; for its spheres, like a vortex, flow into such gyrations that by them are marked

greater and lesser circles with poles as in the great sphere of the world; and the flexure and inflexure of its spires refer to the spires of the foregoing form as the points of its perpetual center; hence its power of varying itself is immensely increased above the other.

V. The fifth or Celestial puts on a new perpetuity and infinity, for this regards as its relative centre the infra-celestial form and all its determinable points; wherefore the ideas of its fluxions are *not to be marked by lines and words*. From the nature of this infinity its faculty of changing states rises eminently above the foregoing.

VI. But in the sixth form or Supra-celestial there is nothing but what is perpetual, infinite, eternal, incomprehensible, the order, law, idea, of the universe and the essence of all essences.

Such now is the ascent and descent of forms or substances in the greatest and in our least universe."

It is to be noticed that here even the idea and the form of forms in the infinite are called substances and that they enter into the subordinate forms actuating them and giving them all their vitality and their direction to the accomplishment of their end which is their use in the ultimates of nature.

IX. THE SIX ATMOSPHERES.

The same succession of forms and substances as applied to the objective world is seen in the six atmospheres—three spiritual, or above the natural sun, three natural or below the natural sun; the three former having life in them derived directly from the Divine Life, the love and wisdom of the Creator; the three lower or natural atmospheres—described also as the aura, the ether, the air,—are called dead because they have not life or motion in themselves but are actuated only by the upper atmospheres; but being fixed in their material, or, as we may call them, angular forms, they cause the things of the earth, and in the human body to remain in existence and to be held together and not to be changed except according to the laws of natural order. Here is the difference

of the natural and spiritual worlds. These three natural atmospheres are further described as "(I.) The purer ether (elsewhere called aura) which is universal and from which is all gravity; (II.) The middle ether (or ether so-called) which makes a vortex around the planets, in which also is light and from which comes magnetism; and (III.) The ultimate ether which is the air." But we are also here informed that the highest of the three atmospheres below the natural sun, which is that of the aura, is inhabited by angels of the spiritual kingdom, while the two lower atmospheres,—the ether and the air,—are occupied by men while they are in the natural world. . . . But it is to be known," and here comes the instruction immediately relating to the point of our search—"that the atmospheres originating in the Sun of heaven, that is, the atmospheres above the sun of the world, *are not three but six*, three above and three below the natural sun,—the three below the natural sun being those (higher atmospheres) which immediately and continually follow the natural atmospheres and cause man in the natural world to be able to think and feel. (*J. (Post.)*, 312, 313.)

We see here then the doctrine of a life permeating and actuating all degrees of substances and matter in the universe, and yet retaining its sole identity as Divine and the source in distinction from the various forms and substances into which it descends. And we are prepared to examine more intelligently what Swedenborg states regarding those purer things of nature which a man takes, when he dies, into the spiritual world. We may note here the distinction observed between what is substantial and what is material; observing that even the idea and forms in the supreme are called *substantial*; and that while the highest aura is called natural, yet it is not defined as material; and that in the *W. L. G.* we are told (see above) that it is the third of the lowest trine of forms—that is the *angular*—that can be properly termed the *terrestrial and material*, and that it is this which serve the fluids and blood and the spirit of the fibres for *corporeity*. With this gradation of forms and substances, and even of the forms and substances

of nature, let us now observe what Swedenborg says of those purer forms which a man takes with him into the spiritual world.

X. WHAT A MAN TAKES WITH HIM WHEN HE DIES.

We have already referred to this expression as it stands in the work on the *Divine Providence* accompanied with the words, that this purer part of nature captured, as it were, by the soul in its natural world, serves after death as a containant vessel to the things of the mind or the man himself. Again in *Divine Love and Wisdom*, no. 257, we are told that the natural mind of man consists both of spiritual and of natural substances; from its spiritual substances thought is produced [see above, *J. Post.* 313], but not from the natural. The latter substances recede when a man dies, but not the spiritual substances; hence, after death, when man becomes a spirit, or angel, his mind remains in the form it had in the world. The natural substances of the mind which recede by death constitute the cutaneous covering of the spiritual body of spirits and angels; by means of this covering taken from the natural world, their spiritual bodies subsist; for this is the ultimate containant. Hence there is no spirit or angel who was not born a man. . And in *Divine Wisdom*, VIII., 7: "An angel or spirit subsists in consequence of having been born first a man in the world; for he derives from the *inmost principles of nature* a medium between what is spiritual and what is natural, by which he is bounded to subsistence and to permanence, having relation by the latter to those things which are in nature, and having something corresponding to these. Hereby spirits and angels can be joined to and with the human race; for there is conjunction and where there is conjunction there must be a medium. That there is such a medium *angels know*; but as it is from the *inmost* principles of nature and as all language is from the ultimates, this conjunction can be described only by abstract things.

XI. LIMBUS.

Noticing that we are here warned of the insufficiency of our earth-language to adequately define these interior principles which "angels know" but we do not—we come now to the interesting definition of the limbus, or border of our personality, after death as in *T. C. R.* 103: "After death man retains the spiritual of his paternal heredity together with a certain limbus from the purest things of nature around it"—and again, in 38³: The "human mind is organized interiorly of spiritual substances, and exteriorly of natural substances and finally of material things."

I think we are prepared to see now that the limbus or the "cutaneous covering" of the spirit which man carries with him when he goes into the spiritual world is not of that grade of substance which is called matter,—or, in other words, that there *are things* which a man *does* carry with him into the spiritual world and yet these are *not matter*.

Matter is declared to be as distinct from substance as the spiritual from the natural: for the substantial is what alone gives reality to the material, the material being the appearance which the substantial puts on to the physical senses of the body. Thus, in *T. C. R.* 280 and 281, Swedenborg says of spirits in the spiritual world—"they are substantial and *not material*; they are in a substantial but not in a material body; their substantial body appears before the senses as if it were *material but it is not*."

Do we not find here the essence of that individuality or determination of the personal life of man after death which man derives and can only derive from nature,—that is, from a world of time and space? It is that appearance of the outward—the environment as of a material world—a world of time and space which the spiritual world essentially, as such, is *not*. These apparent time- and space-relations—with all the vast world-view by social experience that this involves—are what a man can derive only in a world of fixed times and spaces, where they are actual experiences and furnish the forms, or, as Kant calls them, the schemata of all the impressions that come into the

mind through the senses and go to furnish the imagination, to store the knowledges, to build up the memory, which are the character of the man, the form which he carries with him out of nature and retains permanently in the spiritual life. For the material things of which Swedenborg speaks as forming a part of the mind's organization need not be interpreted as the grosser forms of matter, but rather those properties of matter and of nature which give corporeity or body,—to the mind, as a pure organ of willing and of thinking and these are the ideas or impressions themselves which the mind derives through the senses of the body and which it can derive only in a world of time and space: that is, a natural world. Hence to derive these impressions, these distinctly human and social forms “a man must be first born into such a world before he can become spirit or angel.” These material forms of the mind are frequently referred to by Swedenborg but nowhere as consisting of gross matter itself but of that of which matter is the medium of experience—that is, material thoughts, images and ideas. “The spirit of man is his mind,” says Swedenborg, “and this actuates all the body in its inmost parts formed for sensating and acting; it adheres to the corporeals inwardly, and imparts to them sense and motion, and *also inspires the perception as if the body thought and acted of itself!*”

Even these external impressions or sensuous images get their reality rather from within than from without; the material environment is that which *seems* to produce them. [See *T. C. R.* 156.]

The sensuous thought of man is that which is called “*material thought.*” . . . After death the thought with a merely natural man is indeed spiritual; . . . for it consists of corresponding ideas, which indeed appear as if material but still are not material; for *the material man takes the ideas of his thought from earthly corporeal and worldly things* which, in themselves, are natural, and, when the thought of a man is not elevated above these things, he thinks materially about spiritual things. Everything extended in thought is of matter. (See *A. E.* 543, 654, 781; also *D.* 5625; also *De Verbo.*)

These thoughts and ideas so essential to personal human consciousness in any world, and derivable by the mind *only from a world where times and spaces are objectively fixed*, we are justified therefore in regarding as those purest parts of nature which a man carries with him from the natural to the spiritual world and which preserve his individuality or personality there.

If the old objection be urged that this is a form of idealism which does away with reality we can only fall back upon Swedenborg's declaration that Love and Wisdom which make one in God are not abstractions but are in Him as a substance. (*T. R. C.* 76), and "the will and the understanding of man are forms organized of the purest substances." (*D. L. W.* 373. See also *A. C.* 3726.)

XII. THE MEMORY.

Finally we have the most practical exemplification of the offices of the purer things of nature carried into the spiritual world, in that they go to form the memory—quiescent indeed but capable of being called into consciousness and so forming the undying substances of all man's experiences, and the character thence derived. For we are informed that the exterior memory is an organic something formed from the objects of sense in those *substances which are the beginnings of the fibres*. Also that in the memory are inscribed all the things thought, spoken and done in the world; thus memory is the book of life which is opened after death. (*D. P.* 105.)

The time- and space-concept, which we may call the formative principle derived from nature, from which is derived all doctrine or knowledge of forms of geometry, and extension, and the memory itself which is the storehouse, a reservoir of all the experiences of the life in the body—these become, when viewed in the light of Swedenborg's teaching, something far more real than intellectual abstractions. They are what make a concrete individuality; they are procured by means of nature, and they may be called those purest things of nature which lie next to the spiritual. For, to quote the beautiful

language of the *Worship and Love of God* (no. 66), "the soul has taken the images themselves which are the forms of nature and of her light, entering in by the way of the eye, and, having breathed her life into them, has conducted them into the chambers of the memory and in a becoming manner has assigned them each its abode there."

There are two things proper to the natural world which cause all things there *to be finite*; one is *space*—the other is *time*. (*T. C. R.* 27.) "In the spiritual world there are appearances of spaces." (*D. L. W.* 70.) "The objects of sight there appear as if in space and time." (*D. L. W.* 70.) "Without an idea of space and of time man cannot think at all. . . . If he were to put off the idea of time and space and still more space and time themselves, man would become utterly null; there would be nothing left to him from which he could feel and think." (*A. C.* 2054.) "But in the other life there is no idea of space and time but in place of them is state; yet all things there appear as if they were in space, and succeed one another as if they were in time—but in themselves they are changes of state." (*A. C.* 3356.)*

*Even with this survey of the descent of forms in the two orders,—the physical and the psychical,—it may seem difficult to trace a connection much less an identity of these series, so as to associate in any rational conception the higher forms of the spiral vortex with the higher forms of the thoughts of the mind; and we may perhaps doubt whether Swedenborg really intended to teach that there is such a relation of analogy or identity. But the question would seem to find an affirmative answer and illustration, however brief and condensed, in the remarkable passage from the *Spiritual Diary*, n. 222. "There are three solar atmospheres which operate into the natural mind but *not* into the more inward one. There are four *natural* spheres which originate from the Sun. I. The atmosphere that produces hearing is human. II. A purer atmosphere separate from the aerial, is what produces sight or visual imagination for this atmosphere penetrates into the natural mind, and whether it presents material ideas, so called, or fancies and imaginations cannot as yet be well established, but from many things it appears probable. This, then, must be the first atmosphere that reigns in the natural mind, *i. e.*, that which is below the aura. III. Another atmosphere is still purer ether, and is that which produces the forces of magnets which reign not about the magnet only but also around the

XIII. CONCLUSION.

I need not say that I set forth no claim to have solved the question of the nature of the limbus, or of those purest things of nature which can be carried into the spiritual world. That these are distinctly *not material* we may surely affirm; but that they are nevertheless things that we can, *only* in our human capacity, think of under the forms of time and space and thus under the appearances of matter, we must also admit. To aspire to more than this—at least in this our terrestrial sphere—would be perhaps to violate the laws of those purer substances of our minds which take their very forms from time and space. We may however have opened a door into some vistas of these inner recesses of nature not commonly explored and have invited to further search there, content meanwhile with the assurance that, as Swedenborg says, "*The angels know.*"

whole globe. It produces the position therein of the whole terrestrial globe in relation to the poles of the world and also many things which are known by the world regarding magnetic elevations and inclinations. This atmosphere would seem to produce reasoning in the natural mind with which, however, there must be present a spiritual element in order that they live, as it must be into the sight and every other sense in order that they may perceive. IV. The purest ethereal sphere is that universal sphere of the whole world which is presented about the reasonings of the same mind [the concepts of time and space]. Hence that mind is called the natural mind [from this sphere and its forms of time and space] and its interior operations when perverted are called *reasonings*, but when according to order simple *reason* which is a species of the thoughts *arising from spiritual influx*. These spheres are of the sun and may be called solar and thus natural."

A REPORT OF THE PROCEEDINGS IN SWEDEN.

To the Swedenborg Scientific Association:

Since reporting to the Association a year ago, two reports, dated Oct. 16th and March 31st, have been sent to the President. I have also reported several times to the Association's Board of Directors and to the Committee of the London Swedenborg Society. In view of what has been printed in *The New Philosophy* and elsewhere concerning the progress of events during the year, the present report will be very much condensed, but I think it will be useful to refer, however briefly, to all that has occurred, so that a general view may be more easily obtained.

INTEREST IN SWEDENBORG.

Partly as the results of efforts here, but largely due to the pent up energy of a hundred years of labor by earnest students in Europe and America, great strides have been made during recent years in the investigation and publication of Swedenborgiana and in doing justice to Swedenborg's memory. Those who are well informed in regard to the history of events here know that for many decades much labor and treasure have been devoted to the publication of Swedenborgiana and to the investigation and study of the matter printed. But there were not many who realized how important that work had been. At the present time there is a great revival of interest in the scientific and philosophical works of Swedenborg and in all that relates to his life and works. Much interest has been shown, not only in North America, but also in Europe, especially in Sweden, England and Germany. In Sweden the current of events has led to several remarkable public demonstrations at Stockholm and Upsala. Indeed, during the past year such an expansion of activity has occurred that it is now hardly possible to follow all that is going on. There are now three Swedenborg Committees at Stockholm and Upsala, and Swedenborg's significance as a scientist and a great Swede has

recently been debated in both Chambers of the Swedish Parliament. Granted that much of what is now being done to honor Swedenborg's memory is of an ephemeral nature, it cannot be denied that some excellent and permanent results have also been produced. One good result is that the new edition of the scientific works has been greatly extended. But before describing the extensions it will be convenient to refer to the results of

A VISIT TO ENGLAND DURING JUNE AND JULY, 1908.

The publication of the first and second volumes of the new edition of the scientific works and the removal of Swedenborg's remains from London to Upsala aroused great interest in England. Having been invited by the Committee of the London Swedenborg Society to address the Society's Annual Meeting and to confer with the Committee, I travelled to England last June and attended the annual meeting of the Swedenborg Society and of the New Church Conference. The liveliest interest was shown in proceedings in Sweden and at several meetings of the Society's Committee the work here was thoroughly discussed and the following decisions made:

1. The Society subscribed for 125 sets of the Stockholm edition of the scientific works.

2. It was decided to co-operate with the General Convention and the Academy of the New Church in phototyping Swedenborg's theological works.

3. Co-operation with Sweden and America in regard to the proper disposition of Swedenborg's remains was found desirable.

4. For a memorial volume of Swedenborg to be prepared by me is to be published at London; and

5. An English translation of the Swedish matter in Vol. I. of the new edition is to be furnished the Society for their English edition of the scientific works.

6. A report to the Society on the MSS. of Swedenborg and miscellaneous Swedenborgiana is to be prepared by me, so as to furnish a comprehensive plan for the reproduction of un-

published matter in the "Swedenborg Archives" and in other forms.

7. The Society will co-operate with the societies in America in supporting the mission here.

During the year good progress has been made in agreement with the plan as outlined above. Having returned to Sweden I secured the consent of Professor Gustaf Retzius, and, later, that of the Board of Directors of the Association to the plan. There can be no doubt that the co-operation of the Swedenborg Society will greatly increase the scope of the work here and ensure the accomplishment of the various projects in hand.

While in England I made some investigations for new Swedenborgiana and published the results in the *New Church Magazine*. The address to the Swedenborg Society was on "Revived Interest in Swedenborg's Scientific Works and Swedenborgiana." Later, in September, I addressed the Historical Section of the Third International Congress of Philosophy at Heidelberg, on "Descartes and Swedenborg;" and in October the Physiological Society of Upsala on "Swedenborg's Physiological Psychology."

THE NEW EDITION OF THE SCIENTIFIC WORKS AND MISCELLANEOUS PUBLICATIONS.

The London Swedenborg Society having subscribed for 125 sets of the new edition, and a large number of subscriptions having previously been received from America, the *Opera Philosophica et Mineralia* will be included in the edition. Of the edition of 500 copies of Vols. I. to III., about 400 have been disposed of. It has been decided that some of the matter which was first intended for Vol. III., shall be reserved for a new Vol. IV., to include the work *On the Infinite*. Professor Nils Dunér, the Perpetual Secretary of the Royal Scientific Society of Upsala, is preparing the Introduction to Vol. III., and the Professor of Chemistry, Peter Klason, of the Technical High School, of Stockholm, has drafted the Introduction to Vol. V., "*The Principia*."

A portion of the *Daedalus Hyperboreus*, already printed for

Vol. III., has been discarded and a facsimile reproduction by photography will be included in the volume in its place. As the work is going through the press, the Scientific Society of Upsala will also print an edition of the *Daedalus* on fine paper from the same stone plates. This special edition will be issued in 1910 as one of the festival publications of the Society in connection with its bicentenary celebration,—of which more below.

As for the remaining publications in hand:

1. The *Festivus Applausus Caroli XII.*, of which an advance edition of 30 copies was published last spring, has not been completed because some details of the title page have not yet been decided upon.

2. The second and third sections of *Emanuel Swedenborg as a Scientist* will soon be on the market. Of the third section a few copies have been published.

3. Part I. of the Association's series of *Scientific and Philosophical Treatises* by Emanuel Swedenborg appeared during 1908, and some of the remaining treatises necessary to complete Part II. have been translated.

4. The remaining portion of the new edition of the *Worship and Love of God*, in press at Boston, has now been prepared for the printer, so that the printing will now be completed. An index is also being prepared.

5. A new biography of Swedenborg, *Grunddragen af Swedenborg's Lif (The Chief Features of Swedenborg's Life)*, embodying some of the results of recent investigation, was published at Stockholm last January.

Great progress has been made with the *Index Biblicus*. Two of the three large folio volumes are printed and the third will be finished during the summer. The total number of pages is greater than in the case of the phototyped *Diarium Spirituale*.

Additional publications will be referred to below.

THE SWEDENBORG MUSEUM.

The Swedenborg Museum was opened by a special ex-

hibition from May 17th to July 20th, 1908, and a detailed printed catalogue was on sale. The collections of Swedenborgiana in the exhibition aroused great interest and the museum is now to be made permanent, the collections to be on view in one of the central tower rooms of the Northern Museum. The exhibits last year consisted of portraits of Swedenborg, and of his parents, relatives and contemporaries; and objects once owned by Swedenborg, including also many manuscripts, printed works, etc. As a result of the exhibition some hitherto unknown objects have been found.

SWEDENBORGIANA FOR SWEDISH LIBRARIES.

When in London I secured some valuable books for the Royal Library, and I desire to recommend to authors and publishers that they send all matter relating to Swedenborg or the New Church to the central Swedish libraries at Stockholm, Upsala, Lund and Gottenburg, but especially to the great libraries at Stockholm and Upsala, that is, to the Royal Library, the Library of the Royal Swedish Academy of Sciences, and Upsala University Library. At the recent auction of the valuable Swedenborgiana in the Hammer Library, the rarities were distributed among the libraries named, with the exception of the University Library of Lund. The manuscripts and rarest editions went to the Stockholm libraries. The Swedenborgiana of the Hammer Library will be described in a special article.

SWEDENBORG HONORED AT STOCKHOLM AND UPSALA.

Among the means by which interest in Swedenborg's personality and works has been excited in Sweden may be mentioned a large work, entitled *A Blue Book*, by August Strindberg, the greatest of living Swedish dramatists. The work is dedicated to Swedenborg in memory of his home coming to Sweden. Another book which has done good service is Lieutenant's Ernst Liljedahl's *Swedenborg, His Life and World-View*. The newspapers have also contained numerous articles

concerning Swedenborg, in connection with the removal of his remains from England to Sweden.

After the remains had been conveyed from Dartmouth to Carlskrona on the Swedish cruiser "Fylgia," they were, on May 19th, deposited in the Cathedral of Upsala, with the most impressive ceremonies. The Archbishop of Sweden, in an address, referred to Swedenborg's great qualities of mind and heart, which make his memory an inspiration for the Swedish people. I have been informed by the authorities at Upsala who had charge of the proceedings on May 19th that the remarkable demonstration was a spontaneous expression on the part of the numerous corporations who partook in the ceremonies.

The Rector of the University of Upsala, Professor Henrik Schuck, is the chairman of a Swedenborg Committee in charge of the sarcophagus which is to contain Swedenborg's remains and be a sign of the honor in which Swedenborg's memory is held by his countrymen. The professors of anatomy were appointed a committee by the Scientific Society to investigate and report upon Swedenborg's remains. The results of the committee's investigations have been reported to the Scientific Society, and Professors Edvard Clason and J. W. Hultkrantz have delivered five lectures on the subject before the Society and the medical societies of Upsala and Stockholm. Professor Hultkrantz has also modelled a fine new bust of Swedenborg on the basis of the evidence secured. It has been decided by the Society to print a work prepared by the committee, on Swedenborg's remains and person and on the portraits of Swedenborg, in English in the *Acta* of the Society, and also in a Swedish edition. I have been co-operating with the committee since they began their labors. The works will be printed in 1910 in connection with the bicentenary celebration of the Society, and I am now preparing the English edition to be published in the *Acta*. Swedenborg's memory will be especially honored in connection with the bicentenary celebration, when the sarcophagus will probably be finished. Swedenborg was very active in the early development of the Society, which was

founded in November, 1710, and he was also the editor of what may be regarded as their earliest proceedings, the *Daedalus Hyperboreus*, which is also the first Swedish scientific magazine.

As a result of the increased interest in Swedenborg a motion was introduced last January by Lector J. F. Nystrom, in the First Chamber of the Swedish Parliament, that the sum of 10,000 kronor be appropriated for a Swedenborg sarcophagus. In spite of vigorous opposition on the part of several influential members, who succeeded in having the motion adversely reported from the Committee on Finance,—though a favorable minority report was also presented—and in spite of opposition on the floor in both Chambers and also in one of the Stockholm newspapers, the motion was carried on the 15th of April by a joint vote of both Chambers, after it had previously been carried in the First Chamber, but defeated in the Second by a small majority. A few days before the final vote I sent to all the members of Parliament a pamphlet on the Scientist Swedenborg, quoting the opinions of eminent Swedish scientists. The result of the final vote is a complicated one; an account of the history of the motion and of the debates in both Chambers will be published in due course. The main result is that the memory of Swedenborg has been greatly honored by his countrymen, and that the opinion of the public is now largely favorable to Swedenborg, his works being now sold in much greater numbers than before.

ALFRED H. STROH.

Library of the Royal Swedish Academy of Sciences, Stockholm, April 22, 1909.

THE SENSES.

BY EMANUEL SWEDENBORG.

CHAPTER VI (*Continued*).

426. *The uses of the fifth pair, especially of the branch of it which goes to the eye.* 1. It originates on both sides of the protuberance, it soon communicates with the branches of the dura mater, then in the receptacula cavernosa it forms a ganglion; the trunk is soon divided into three branches which cross the sinus cavernosi. The first branch is the ophthalmic or orbital nerve, it passes through the sphenoidal fissure, it first communicates with the nerve of the sixth pair and with the intercostal nerve; it is divided into three branches: the first or frontal branch gives filaments to the fat of the orbit, to the neighboring membranes, to the elevator muscle of the orbit, to the frontal muscle, to the superciliary muscle, to the orbicular muscle or muscle of the teguments, together with the hard portion of the auditory nerve. The *Second* or nasal branch toward the side of the nose, communicates with the ganglion of the third pair, it also crosses above the optic nerve, gives off filaments to the elevator muscles, to the internal canthus near the caruncula lachrymalis, to the neighboring parts of the orbicular muscle, the muscle of the eyebrows, the pyramidalis nasi, the teguments; an offshoot goes to the nose, but by reflection, to the cranium, to the cribriform plate. A *third* branch goes especially to the lachrymal gland, perchance it is bound to the dura mater; before it goes to the lachrymal gland, it sends off a little branch to the external lateral part of the orbit, to the neighboring part of the temporal muscle, to that of the orbicular of the eyelids, of the masseter, of the teguments, of the conjunctive membrane, to the fat; together with the third pair it enters the eye even to the uvea. The *superior maxillary nerve* also gives off filaments to the fat of the orbit; it is distributed to the pituitary membrane, to the mouth, to the sockets of the teeth, to the

muscles of the eyelids, to the neighboring parts of the nose and lips, to the teguments; it communicates with the seventh pair, at the palate, the pterygoid muscles, the peristaphlinus muscles, those of the pharynx, of the posterior nose, at the Eustachian tube. The *inferior maxillary nerve* gives off filaments to the tongue, the temporal muscle, the concha of the ear and its neighboring parts, to the masseter, to the buccinator, to the muscle of the lower lip, to the pterygoid muscles, to the buccinator muscles, to the buccal glands, to the muscles of the lips, to the concha of the ear, to the neighboring parts of the nose, etc. 2. This nerve is the most general communicator and regulator of inmost things with outmost; thus it exists in order that it may consociate all states, for nature thus proceeds to more general things; as in the eye, there, with the nerve of the third pair, it enters the eye itself, surrounds the optic nerve, enters the ganglion of the third pair; thus it approaches in like manner inmost and outmost things, as the muscles of the eye, of the lids, of the eyebrows, of the frontal parts, and moves the outmost state or the muscles of the eye generally. 3. Thus it communicates the states of sensation with the state of the changes, by means of the state of the affections of the brain; for it surrounds the optic nerve, enters the eye itself, perhaps the vitreous humor, thus it actuates a more general cause. 4. Indeed it disposes the state of the glands for the conservation of the eye, which is the second thing, wherefore it approaches the lachrymal gland, the rest of the glands, the lachrymal sac, the nostrils: this nerve it is which presses out the tears according to the state of the brain, wherefore it adjoins itself somewhat closely to the dura mater, before it approaches the lachrymal gland, and gives off filaments to the dura mater; thus it properly connects the outmost states of the brain, or those which reflect into the dura mater, with the inmost states of the eye. 5. The fifth pair also conjoins the outmost states of the eye with the outmost state of the face, or the outmost muscles of the eye with the rest of the muscles, wherefore it goes to them, and conjoins itself variously with the seventh pair. 6. It likewise conforms

the rest of the senses, as taste or that of the tongue, smell or that of the nostrils, hearing or that of the ear, with their motions, likewise as in the eye. 7. It conjoins the states of all the sensories with one another, that they may not disagree; wherefore it is a universal regulator. 8. It conjoins also in some way the states of the body with the states of the head; wherefore it reflects filaments into the great intercostal nerve. 9. It seems to derive its filaments from the cerebrum and the cerebellum, so that its function may be both natural [*i. e.*, involuntary] and voluntary. 10. The filaments which are of the cerebrum, or those which communicate with the filaments of the cerebrum in the medulla oblongata, seem to receive sensations; the filaments which seem [to go] into the muscles seem to be of the cerebellum; thus it joins sensations with natural [involuntary] motions, in order that they may altogether coincide; thus it joins nature to the understanding, or the cerebellum to the cerebrum: this is evident from its whole function. 11. But to give the office of this nerve distinctly would be too prolix; to do this would require a whole treatise on the organism of animal [animate?] motion. 12. Thus then in the eye this nerve seems to conjoin sight with motion, so that all things may be harmonious according to affections. 13. From this nerve also it appears how titillation in the nostrils by means of snuff, etc., affects the eye, because the dura mater is excited, to which it adheres, which thus vibrates the lachrymal gland, and the rest of the eye; 14. Also that it is especially the nerve which causes sneezing, for it carries the dura mater away into convulsions; it also moves the intercostal part, as the lungs, thus the nostrils, the eyes, the larynx, the palate, and all else that it approaches; and it does this by communication with the sixth pair.

427. *The use of the sixth pair, or external motor nerve.*

1. This nerve also is expended almost only upon the abductor muscle of the eye. 2. It arises from the lowest part of the annular protuberance near the cavity of the vertebral parts (*vertebraliūm cavitatem*), just above the corpora olivaria. 3. From the use of the muscle it is known why this nerve is also

expended upon the motion of the eye. 4. For the abductor is the antagonist of all the four or five other muscles, as the trochlear is the antagonist or equilibrator of the four former muscles; therefore it draws away. 5. All the rest of the nerves and muscles as, it were conjoin the sight of the eye to the brain, for they draw it toward the superior parts, also inward; but this muscle disjoins and averts the sight of the eye from the sight of the brain. 6. Thus it is of an altogether different function, although it acts in consort with the other muscles; for the others consociate, this draws asunder, as may appear from those who, while they are thinking, dilate the eye, and thereby admit much light into the eye. 7. It rules itself in consultation with the other muscles; it is joined by branches to the ophthalmic nerve of the fifth pair.

428. *The uses of the seventh hard pair.* 1. This muscle, besides the ear, rules the whole muscular face. 2. To it is adjoined the fifth pair, which unites sensations with motions. 3. Hence also it goes to the frontal muscles, to the palpebral muscles, and, together with the fifth pair, is conjoined to the other parts of the eye. 4. Thence arises the universal harmony of all the parts. 5. Special and particular harmonies can be given everywhere, for no fibre, nor even a little point, designates [anything] without regard to use. 6. Wherefore the working out of the particulars is an extremely vast undertaking; it is enough if it be of the generals, for this is the science of sciences; particulars draw away the ideas from the idea of generals; he who sticks long in particulars, never becomes a capable investigator of generals.

429. *The eyes of Insects.* From Leeuwenhoek: The single optic organs seem to be circumscribed by six sides; in the sea-crab, called *squilla*, by a quadrilateral figure. In every organ a very small circle is shown. He also saw a great abundance of pellucid particles interspersed among the optic nerves. In the fly there are eyes looking upward, horizontally and downward. A fly is furnished with twelve thousand five hundred and forty-four eyes. In the mordella were noticed twenty-five thousand and eighty-eight lucid particles in the single

eyes; three circles, at least, surrounded the pellucid point. In the mordella he saw single round parts distinctly separate from each other, and in their interstices there appeared a kind of thin light; he represented an inverted flame, and many flames at once. He distinguished the motion of the single parts.

Swammerdam: The uvea [cornea?], which could be taken off, appeared on the surface; behind this the cornea [uvea?]. It was furnished with hexagonal divisions. In the cancellus the optic nerves run down by decussation above the brain; they end in the surface of a spherical form. The corneal tunic is divided like a net; the divisions are hexagonal; a gelatinous matter was sticking in the cavities of the divisions of the cornea. That gelatinous matter is involved in innumerable fibres. The fibres make a pyramid; they are all terminated in a gray substance, under this were the optic nerves, all of them were composed as it were of globules: here there is a decussation of the optic nerves in the brain itself. In respect to the bee: there were two eyes and three smaller ones interjected between them; there is an external cornea; the divisions are into globules: they believe therefore that they are many little eyes; the little intercepted masses are globular, wherefore the eye has the appearance of a net; the uvea succeeds to the cornea; it is next to the surface; it is not perforated; on the inner surface of the cornea there is a somewhat opaque matter, becoming red (*purpurascens*), in some it is green, etc. Under the uvea there are as many fibres as there are divisions of the cornea, hexagonal above but becoming acuminate below. They form a hexagonal pyramid. The fibres also are stained with a like color. All the fibres end in the underlying membrane; the fibres are connected with the cornea: There are innumerable air tubes which ascend. Under this membrane there lies another thinner one; then still another kind of fibres is discerned, upon which are superimposed the pyramidal fibres, but fewer of them; these fibres cohere to the brain; they are of the same color as the brain, they are

similar to the cortical substance; the brain appears within. In some also the pupil can be covered or closed.*

430. 2. *From the use of the eyes of insects of every kind it may appear, in agreement with the principles given above, what quality of texture of eye has fallen to the lot of each one.* 1. That the eyes must be very simple and very perfect, because they are in a purer and simpler world. 2. That they can see more minute, indeed most minute, objects, such as they collect, choose and carry with their delicate little mouths and tongues from leaves and other things met with. 3. That the same little objects are seen by them at a very short distance. 4. That they recognize from sight whether they are suitable, wherefore they seem to have at the same time a purer sense of smell. 5. That since their eye is their purest sense,—the sense by which is the most immediate relation to the nature and instinct of their soul,—therefore their eyes must constitute, as it were, the essence of their brain. 6. That they seem to be made for shady rather than for bright light. 7. That they can look in every direction. 8. That they can avert dangers, such as would offend and disturb those very delicate organs. 9. That they have a kind of hearing in their eyes. 10. Thus they draw in all those things which happen in a purer degree of nature, whither our most perfect microscope can scarcely penetrate.

(*To be continued.*)

*Swammerdam's own words in the place which is evidently referred to (translated from the German), seem to contradict this. They are:

"But how is it with the sight of bees and other insects? I answer that the structure of their eyes proves as clear as the sun that the sight with these is not brought about as with us, that is, by the penetration of the rays of light through the pupil into the net-like membrane, but through a mere contact of the inverted pyramidal fibres, which set in motion the light, forced through the cornea. These eyes are therefore so constructed, that they can receive the images of things by a mere casting forth of the repelled light, which, in fact, must be an exceeding delicate sense. And since the pupil does not so close itself with insects as with us, nor have they a hole, their sight must be most complete, because they can constantly receive a large mass of rays. Hence it also happens that many insects can see in the night," etc.

THE NEW PHILOSOPHY.

VOL. XII.

OCTOBER, 1909.

No. 4.

Editorial Notes

THE FIBRE.

We present to our readers the first installment of a translation of *The Fibre*. Swedenborg seems to have written this work about 1741 or 1742. The first edition of the *Economy* published in 1742, contains an advertisement of it as "shortly to be published" (I. *Documents*, p. 585). It remained in MS. however, until over one hundred years later, when, in 1847, it was published in Latin under the editorship of Dr. Wilkinson. No translation, nor any subsequent Latin edition has ever appeared. Dr. Wilkinson published the work as "Transaction III" of the *Economy*,—Transactions I and II being the two volumes published by Swedenborg himself. But an examination of the author's prospectuses of the *Economy* series of volumes shows that the present work was to have formed the first and main part of "Transaction V.," entitled "Introduction to Rational Psychology,"—the two preceding Transactions treating of the Brain, and the one following of Rational Psychology (see III *Doc.*, p. 925).

As the reader will notice, the work commences with n. 58. The MS. containing the preceding numbers has never been found, but the work itself shows that these numbers consisted entirely of excerpts from the anatomists. These excerpts can be restored with considerable accuracy from references to them in the text; indeed the work of restoration has been nearly completed by the present translator and it is to be hoped that the restored paragraphs will be printed with the work itself. But of this matter we shall speak in a later issue.

We close this brief notice with the following eloquent passage from the Latin editor's Preface: "Swedenborg's clear sighted Induction penetrates the secret places of the animal

body; he illumines all things with rational light; he cherishes them with a heat, *i. e.*, a love, that is truly human; and to the newly awakened and reverential thought he offers the whole organism as a work worthy indeed of the great Deity. He again joins soul to body, and reconciles and restores the power of the higher over the lower, *i. e.*, of the spiritual over the natural. Thus our organic body, formerly a mere subject of anatomy, is given to us, and especially to our mind, as animated anew. With him we have risen from the grave and the corpses of an effete science to the living light and the pleasures of a Divine philosophy; and, firmly established in faith, we await with joy still more enlightened days."

THE WORK ON GENERATION.

We print below a list of subscribers to the proposed new edition of the work on Generation. Dr. Boericke's offer to publish this work is a generous contribution to the cause for which our Association stands; and his requirement of a hundred subscribers before undertaking the work, is a very modest test of whether there is any considerable demand for it. The number of subscribers thus far received is gratifying and promises assurance of the publication. It causes us some surprise, however, that the percentage of subscribers who are members of the Association is not larger. The total membership at the date of writing is 199, and of this number only 39 are included in the list given below. We suppose that in some cases this may be due to delay; it is likely also that, coming in the vacation, the notice in our last issue did not come to the attention of all. And in this connection we would again ask our readers to call the attention of their friends to the announcement of Dr. Boericke's offer.

As already stated, the required number of subscribers is 100, and it is expected that the work will be ready within a year after this number has been received. But, with only a hundred subscribers, the publication will be confined to text with the possible inclusion of one anatomical plate. If, however, 125 or more subscriptions are received the book will include a number of plates,—indeed all that are necessary if the

support justifies the expense. In a work of this kind plates are almost a *sine qua non*; in some cases, indeed, it is almost impossible to follow the text without them. The physiological works have never yet been published with plates, and the studious reader is often put to much trouble in consulting and identifying the plates of modern anatomies. It is hoped that this may be obviated in the prospective edition, and that the edition itself may mark a new policy in all publications of Swedenborg's physiological works.

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THE FIBRE.

I.

THE CORTICAL AND CINERITIOUS SUBSTANCE.

Induction.

57a. *The cerebrum, cerebellum, medulla oblongata and medulla spinalis consist mainly of two substances,—a Cortical or Cineritious, and a Medullary or White. The cortical or cineritious-colored substance lies just under the pia meninx, encompassing the cerebrum like a bark and densely encrusting it. It is also found within the cerebrum,—for example, behind the ventricles and in the posterior lobes,—where it is sparsely inserted in the white or medullary substance. This same substance also occupies the exterior parts of the cerebellum, though it there resides more sparsely; and it penetrates deeply into the cerebellum under the appearance of a branching tree. On the other hand, in the medulla oblongata,—for example, in its two principal and other eminences as well as in the stem itself,—the cortical substance is interposed in the white substance in striæ or streaks; and in its downward course towards the great foramen of the occiput it is compressed and concentrated until at last it becomes an axis holding the interior position while the medullary portion is on the outside. In this way it flows down through the whole course of the spine up to the first lumbar processes where at last it is no longer continued.*

Hence in its descent, the cortical substance contracts from the peripheries to a central axis, and in its ascent it spreads out from continual centres towards the peripheries. And this, in order that active forces and their endeavors to action may be concentrated before they are determined into act in the body; and that passive forces or sensations may be poured forth toward the peripheries before they are perceived in the common sensory which is the very circuit of the cortical cerebrum; thus in exactly the same way as in the great system or macrocosm.

Wherefore the cerebrum and cerebellum are found to be each divided into its hemispheres, and these again into their little hemispheres; and in the single divisions poles are formed and axes shadowed forth, to which the mediate substances constantly refer themselves by spiral circumvolutions. Such an architype of the universe is delineated in the brain, especially in the human brain, and most perfectly in its several parts.

And in order that the cortical spherules, which are so many forms of the forces of the little animal world and nature, may remain efficient, sufficient, and multiplied according to need, and that they may also be capable of expansion and compression both singly and conjointly they are allotted a position in the spacious surface of both the brains,—a surface divided into tortuous windings, furrows and ridges,—just under the pia meninx and proximate to little arteries flowing with the better blood.

From these considerations it is quite apparent that in perfect and healthy brains and medullas, all things with their component parts are so disposed and ordered that nothing more disposed and more ordered can be conceived of in the whole of nature. For each single cortical spherule is so situate, and each fibre so flows, that it seems to itself to be in the centre, in the radius, in every point of the periphery and in a thousand points at the same time; and thus to be established in the very conatus of the single parts and in the motion of the whole; and hence in such state that, of itself and its own nature, it knows what the soul is intending in the beginnings and what she is doing in the extremes. Hence arises the order, ratio, unanimity, harmony and love which perpetually reigns between the single parts and the larger and smaller wholes in this microcosm.

58. The cerebrum, cerebellum, medulla oblongata, and medulla spinalis consist mainly of two substances,—a Cortical or Cineritious, and a Medullary or White. Malpighi, Ridley, Bartholin and other illustrious anatomists all agree that Piccolomineus was the first to observe the difference between these two substances, calling the cineritious body, which ap-

appears cloudy, somewhat turbidly transparent and of a leaden or mouse color, and which first meets the eye, the Cerebrum proper, and the interior shining and white body, its Medulla or Marrow. Leeuwenhoek, on the other hand, examining the cortical substance to its very parts, found it to consist of extremely pellucid, crystalline and oily matter, and therefore he preferred to call it Vitreous rather than cortical. Perhaps also, by reason of the form and essence of its parts it might fitly be called Granular, Glandular, or Discrete, and the medullary substance, Fibrillar, Vascular, or Continuous. But the objection arises that the eye, the index of the mind, prefers differences marked by colors to those which are sought from the texture and form resulting from nature, because the latter flee the unaided sight. Nor should we rashly depart from received usages of speech when the thing expressed is equally well understood by the ancients as by ourselves. One thing should be carefully borne in mind, namely, that this substance is called Cortical when it constitutes the cortex (bark) or outer circuit of the brain, and Cineritious when it is sprinkled in the interior medullary substance.

But whence arises the diversity of color? The cortical or cineritious substance, which in itself is translucent, is thickly interspersed and beset with vessels of a reddish tinge, and is differentiated by continual little interstices. These induce a certain tempering and shade on the light of the parts, and thus, with the vanishing of this light, there arises a bluish grey color, like the grey of fresh ashes, or like a color growing from white to livid. The medullary substance, on the other hand, is woven solely of little vessels and fibres, each by itself equally pellucid; but by various winding paths these fibrous and vascular shoots run into flexures, they decussate and mount over each other, and, by mutual divarications, they form spongy plexuses which are beset with globules of diverse form, dimension, and nature, and with interjected fluids. Hence arises the whiteness. It is somewhat similar to the case of an aqueous or oily fluid, the white of an egg and other similar matters made up of purely diaphanous principles, when reduced into fibrous forms by means of a lixivial salt, or into

bullular forms, *i. e.*, into froth, by shaking. Such also is the case with the diamond, crystal, glass, ice and other pellucid bodies; when such bodies are broken up into minute polygons and little pieces of differing forms, or when they are cut into chips, then, in place of pellucidity, there arises a bright and snowy color suitable for the reception of all other colors.

59. *The cortical or cineritious-colored substance lies just under the pia meninx, encompassing the cerebrum like a bark, and densely encrusting it.* So great is the luxuriance of the parts constituting this crust that they must be numbered by myriads of myriads, especially in the large human brain. Their marvellous number may be inferred from the density of the crust compared with the minuteness of the parts. But in Transaction II, in the chapters in the Motion of the Brain, and on the Cortex,* you will find it deduced from the experience of leading anatomists that there are as many forces of every animal kingdom, as many little brains, eyes, and internal sensories, and, moreover, as many leaping and animating points or little hearts, in a word, as many active principles and origins of motions and vital modes,—as there are substances of this cortex or cineritious body. I therefore leave to the reader to judge how great is their abundance, and how ordered their disposition. For they are co-ordinated in such a way that each single substance resides and acts freely in its own little space; a number of them then consociate together into a little ball or glome which is held distinct from its neighbor by its own fissures and little spaces; these glomes in their turn combine to form a more general glome, also bounded by clefts; and these more general glomes, again, unite together, weaving themselves into tracts, not unlike the convolutions of the intestines, and discriminated by winding interstices and comparatively wide furrows. Thus the cerebellum, born in this substance and primarily having its existence therein, grows by degrees from points to its own dimensions, and from parts in the most distinct manner into a body. The little places

*The reference is to Economy of 1 *seq.*, and 69 *seq.* the Animal Kingdom, vol. II., no.

and beds occupied by this cortical substance lying between the serpentine processes [of the pia mater] next to the surface of the cerebrum, are shown by Ruysch in a single plate; see Transaction II, nos. 87, 147.

60. *It is also found within the cerebrum,—for example, behind the ventricles and in the postreme lobes,—where it is sparsely inserted in the white or medullary substance.* For if the cerebrum be cut along the hollow of the lateral or superior ventricles up to its extreme borders extended over the cerebellum, a dense medullary substance is exposed variegated with darkish streaks. Thus we again find the cineritious part mingled with the white, almost as pictured in Vieussens' figures. That the cineritious substance found in the recesses of the cerebrum, in the cerebellum, and in the medulla oblongata and medulla spinalis is of a similar stock and nature as that found in the circuit of the cerebrum, where it is called cortical, is made clear by the microscope, by the forms of the substances and their origins and offices, by the fibres springing from them, and by all other criteria. Malpighi therefore has no hesitation in asserting this fact, his words being, "The substance of the cortex observed in the ventricles of the cerebrum, and again at the beginning of the medulla spinalis, is of the same character [as that observed in the exterior region of the cerebrum]. . . . In the interior portion of almost the whole of the medulla spinalis the cortex, which I have described, retains the same glandular character." [*De Cort. Cer.*, cap. I.] (Trans. II, n. 76.) And therefore from a distinct knowledge of the ordination of this substance we may conclude concerning the offices which each one of its congeries, wherever set, is to perform in the body. But this is a work, and requires labor (*Sed hoc opus, hic labor*).

61. *This same substance also occupies the exterior parts of the cerebellum, though it there resides more sparsely; and it penetrates deeply into the cerebellum under the appearance of a branching tree.* If the cerebellum be cut transversely up to the vermicular processes,* the great valve of the cerebrum†

*The vermiform processes.

†The valve of Vieussens.

and the underlying ventricle or calamus scriptorius, and through the middle peduncle, the entire face of this tree will be exhibited to view; namely, a medullary trunk formed by the juncture of three stems, with its branches, twigs and leaves. For so does the pia mater wind its way; the capillary vessels press upon this membrane; from these vessels spring the cortical spherules; and on these grow the fibres, each being so disposed that, by discriminations of colors, light and shade, a spreading forest is represented. The cortex itself is born into this form as soon as it is brought forth, and into this form it begins to bud out from its tender infancy; for it straightway branches around its arterial mother, on whom it hangs like a cluster of grapes on its stem. Thus it is initiated into this its form from its first origin. Similar arboreal forms, effected by these two differently colored substances, are seen in the cerebrum, as is evident when any of the *tori* or *glomes* of its substance are cut transversely; cf. *Trans.* II, nos. 76, 79, 150. Thus the cerebrum is seen to be a conglomeration of as many little cerebrums as there are congeries of the cortical parts. The cause of this vegetation is evident, for in this way and no other can the cortical origins bring forth their offspring or fibres, and, having brought them forth, can nourish them in particular and in general, and educate and rule them; and they, depending on their arterial parent, can freely accomplish in the meningeal folds their modes and motions, can live their life, and be expanded and constricted.

62. *On the other hand, in the medulla oblongata,—for example, in its two principal and other eminences, as well as in the stem itself—the cortical substance is interposed in the white substance in striæ or streaks.* As in the *corpora striata*, the *thalami* of the optic nerves,—called also the *crura* of the medulla oblongata—the annular protuberance,* the pyramidal and olivary bodies, and the stem of the medulla oblongata around the fourth ventricle. The bodies first mentioned are far more striated than the others, the optic *thalami* being besprinkled with cineritious substance, or with tender little

*Pons Varolii.

eyes. But at the extremity of the medulla oblongata, anterior to the great foramen of the cranium, the discriminations or striæ begin to run together; for the cineritious layers there converge into an axis. Thus we have the explanation of our next induction, namely, *And in its downward course toward the great foramen of the occiput it is compressed and concentrated until at last it becomes an axis holding the interior position while the medullary portion is on the outside.*

63. *In this way it flows down through the whole course of the spine up to the first lumbar processes where, at last, it is no longer continued.* The first region of the spinal axis is called the cervical region, the second the dorsal, and the third the lumbar. The cineritious axis runs through the middle of this spinal cylinder or pipe, while the white substance occupies the surface,—just the opposite to what obtains in the cerebra. Then comes a medullary substance, emulous of the nerve, without any interspersed cineritious substance. This, descending like a cone, ends in an apex where it is called the cauda equina.

64. *Hence in its descent the cortical substance contracts from the peripheries to a central axis, and in its ascent it spreads out from continual centres towards the peripheries.* An axis is an elongated and continued centre; for in a cylinder, cone and other like figures there the as many centres as there are peripheries. The simple or circular figure enjoys only one centre; the ellipse, on the other hand, has many, extending from focus to focus; and so with other figures, respectively to their surfaces. But I would perhaps seem to be relating wonders, if I should say that there is a figure whose centre is in every point of the periphery, or whose periphery is made up of mere centres. Of this figure we shall treat in the following pages.

65. *And this, in order, that active forces and their endeavors to action, may be concentrated before they are determined into act in the body.* It is well known even to tyros that the beginnings of all bodily actions are in the brains; for will and determination precedes the action itself which is effected by the motion of muscles. It is likewise also evident that the fibre drawn forth from the cortex of the cerebrum

flows down through the medulla oblongata and medulla spinalis towards the origins of the nerves, and through these, it flows with the active forces of the cerebrum into the muscles. From these facts it now follows that the verimost beginnings of actions reside in the cortical substance of the cerebrum. These substances, therefore, may be deservedly called the forms of the forces of animal nature. But instead of active forces let us substitute the nature of heavy bodies, for the two mutually correspond. The light of experience shows that, for the sake of coming to a state of rest or equilibrium, heavy bodies are in a perpetual endeavor towards the centre of their sphere, called the centre of gravity, or to their *punctum immobile*. So it is also necessary that active forces, with which heavy bodies are compared, be concentrated in the brains, as in atmospheres, before they are determined into act, or give forth an effect. Aristotle seems also to have observed this, where he says, "The heavy is that which is prone to be borne to the middle, that is, to the centre; the most heavy, that which is gathered under all other bodies [which are borne downwards]. Everything that is borne upwards or downwards has either lightness or gravity, etc. A body which is borne in a circle cannot possibly have either gravity or lightness. Local motion in a straight line is not in accordance with nature herself." (*De Coelo*. lib. I. Cap. iii.) He proves that neither what is borne to the middle nor what is borne from the middle can be infinite, because the middle is something definite. (*Ibid.* Cap. VI.)

66. *And that passive forces or sensations may be poured forth towards the peripheries before they are perceived in the common sensory which is the very circuit of the cortical cerebrum.* Sensations, because they are modifications arising from touch and are received by the common sensory, are so many passions* of the soul, and, therefore, they are to be classed as light bodies which strive from centres to surfaces. For the sense of touch is carried by its own fibres into the axis of the medulla spinalis and hence upwards towards the cortex of the

*Passion is here used in its root meaning as opposed to action.

cerebrum; taste and hearing into the medulla oblongata, and hence by continuous fibres towards the same circuit; smell through the cribriform plate into the corpora striata above, and thence into the whole cineritious and cortical substance of the cerebrum; sight, like the rays of light or the modes of sound, runs by a still shorter route, namely, through the optic nerves, the thalami of those nerves, the medullary substance by which they are surrounded, and especially through the base of the fornix and the corpus callosum, into all the cortical spherules, which are so many little sensories, and internal eyes of the utmost acuteness. See Trans. II, nos. 191 to 195. *Thus in exactly the same way as in the great system or macrocosm.*

67. *Wherefore the cerebrum and cerebellum are found to be each divided into its hemispheres, and these again into their little hemispheres.* The cerebrum is divided by the falx and the longitudinal sinus; the cerebellum by the insinuation of the dura mater—though here the division is not so plain; and the medulla spinalis by the anterior fissure. In like manner also the cortical volumes of the cerebrum, and the lamellar insinuations of the cerebellum are divided by the falciform processes of the pia mater, and by little arterial quasi sinuses. So also the particular glomes of this same cortical substance, which represent a little cerebrum in smaller type; see above, nos. 59, 61. Thus the brains are divided into their hemispheres and little hemispheres.

68. *And in the single divisions poles are formed, and axes shadowed forth.* As regards the *poles*: In the cerebellum near the vermicular processes* they are delineated quite plainly by Eustachius and other anatomists. But in the cerebrum they are not seen so clearly; yet they are found in its prow, or in that part which lies just under the coronal spine† and the crest of the ethmoid bone. In some calf brains I have observed them quite plainly. To these cerebral poles all the gyres and convolutions of the cortical substances refer themselves, and also the winding paths and interposed insertions of the pia meninx.

*The vermiform processes.

†The frontal crest.

Moreover, the larger interstices of the medullary substance converge towards the cribriform plate or the coronal spine mentioned above, from which point run the first sinus of the dura mater and the process of the falx.

With regard to the *axes*,—I speak of the common axis of the whole encephalon: It is a certain perpetual duct or channel, commencing almost from the fissure between the prominences of the cerebrum, and continued under the floor of the fornix, through the third ventricle, the aqueduct of Sylvius and the calamus scriptorius up to the medulla of the spine, where it projects itself from the centre towards the surface. This channel runs through that region of the cerebrum which is most at rest. The single congeries of the cortical substance have also their axes, if not visibly represented, still shadowed forth when we have regard to the form and determination of their motion. For it is a constant truth that a circumgyration, whirl, and motion, such as is that of the cerebrum, could never be effected without poles and axes, or without a respect to poles and axes; and unless these be investigated we ask in vain what the cerebrum does, and its members and parts. Therefore I have bent all my powers to their investigation.

69. *To which the mediate substances constantly refer themselves by spiral circumvolutions.* It is a canon of geometry that where there are poles and axes there is also a spiral fluxion; and where there is a spiral fluxion there are poles, axes and larger and smaller circles, just as in the great sphere. It is evident from mere sight that the circumvolutions of the surface of the cerebrum wind into the curves and modes of a spire. But it is best to adduce the description given by Willis: "Within its single partitions, (he says), the whole structure of the cerebrum is seen to be still more divided and variegated. For its whole exterior surface is everywhere rendered uneven and tortuous by gyres and convolutions almost like those of the intestines. These gyres, proceeding by a sinuous winding, and, as it were, a spiral circuit, from the anterior part of the cerebrum to its posterior, surround both its hemispheres one circumvolution succeeding another in a continued duct; that is, in such a way that at the bottom of any

given furrow a convolution rising on the right side is carried to the left; then, immediately following it, another convolution is set up, emitted from the left side to the right; and in this order the inequalities of the whole cerebrum are alternately variegated." (*De Cerebro*, Cap. X, Sec. 3.)

70. If the whole mass of the cerebrum, and also its single congeries, flow into such a form of motion, what then must be thought concerning its least part or the cortical spherule? Do you not believe that here also are represented poles, axes and circles? Through the middle of such spherule runs a channel, which, like its common axis, is continued into the appended fibre. See Trans. II, nos. 124, 125, 126, 127. For in least things nature is pure and in the greatest freedom, and there she reigns with the utmost perfection in all her science, art, right, power, law, and court of action; nor can the common form, or the form of the entire brain, result without the harmonious conflux of forms of a more perfect nature. Hence now follows our next induction which is already explained, namely, that *Such an archetype of the universe is delineated in the brain, especially in the human brain; and most perfectly in its several parts.*

71. *And in order that the cortical spherules, which are so many forms of the forces of the little animal world and nature, may remain efficient, sufficient, and multiplied according to need, and that they may also be capable of expansion and compression both singly and conjointly, they are allotted a position in the spacious surface of both the brains,—a surface divided into tortuous windings, furrows and ridges,—just under the pia meninx and proximate to little arteries flowing with the better blood.* That the cortical spherules are so many forms of the forces of active nature, see the whole chapter On the Cortex, in Transaction II, [nos. 69-207]. That they are immensely multiplied, see above, n. 59, and Transaction II, nos. 140, 176-183. That they are capable of expansion both singly and conjointly, see Transaction II, nos. 153-159. That the surface is divided into tortuous windings, see above, n. 69. I pass by any exposition of the remaining parts of this induction, because they are clear.

72. *From these considerations it is quite apparent that in perfect and healthy brains and medullas all things, with their component parts, are so disposed and ordered that nothing more disposed and more ordered can be conceived of in the whole of nature.* See Trans. I, n. 248, seq. But, O, how dull of perception are they who believe there is nothing regular, ordered and distinct, except what is acknowledged by the judgment of the eye! In the eyes of their mind is set, as it were, a cataract, and the points of rational light straightway turn them dizzy. If only they evolve visible phenomena to their causes, they will surely find nothing unarranged, nothing wandering in the chance of conflux, and without law.

73. *For each single cortical spherule is so situate, and each fibre so flows that it seems to itself to be in the centre, in the radius, in every point of the periphery, and in a thousand points at the same time; and thus to be established in the very conatus of the single parts and in the motion of the whole; and hence in such state that, of itself and its own nature, it knows what the soul is intending in the beginnings, and what she is doing in the extremes.* Similar to what we find in the parts of the cerebrum, we find also in the parts of the atmosphere, as is abundantly evident from the rays in the ether, sounds in the air and waves in the water. (Trans. I, n. 66.) It is most important to note that there is no least fibre or vessel which is not set in the very stream of the motion of the cerebrum, cerebellum, medulla oblongata and medulla spinalis, yea in the stream of the motion of every single viscus of the body. It is so with the carotid arteries situate between the lobes; with the branches of these arteries in the winding interstices; with the twigs of the branches between the ridges and around the glomes of cortical substances. It is so with the greatest vessels, as the longitudinal sinus between the hemispheres, and with the least, as the fibres in both meninges and in the medulla itself. When, under this rule, I examined the cerebrum and cerebellum with their viscera and appendices, I saw that it would be possible for me to trace out with some clearness the offices of them all,—a discovery which afforded me no little light and gladness.

74. *Hence arises the order, ratio, unanimity, harmony and love which perpetually reigns between the single parts and the larger and smaller wholes in this microcosm. That everything is first founded in a centre, and contains within itself the reason for all that follows and refers itself to all that precedes whereon it depends and by virtue whereof it exists as it does and in no other way, see Transaction II, nos. 252, 260. But you will find these things explained in our Psychological Transactions.**

II.

THE DETERMINATION OF THE MEDULLARY SUBSTANCE IN THE BRAIN.

Induction.

74a. *The medullary and white substance of the cerebrum is seen to exist and find its origin in the confines and termini of its cortical substance. Hence the medulla is a congeries of mutually interwoven fibres and little vessels which connect with each other in various ways, though for the most part after the manner of a network, and thus at intervals; and it comes forth as a globe almost egg-shaped, or as a great medullary nucleus, called by the old anatomists the Corpus Callosum, and by the modern, the Centrum Ovale. This globe is not a continuous globe, but is wonderfully divided up into members and cavities, such as eminences, tubercles, fornices, glandules, ventricles, aqueducts, fissures; which, when deeply examined and weighed in the order in which they succeed each other and co-operate, indicate with some clearness that the cerebrum is a large gland, and a laboratory completely furnished with chemi-*

*In a manuscript outline of the "Transactions" which were to constitute the Economy of the Animal Kingdom, Swedenborg gives "Introduction to Rational Psychology" and "Rational Psychology" as the titles of Transactions V and VI respectively.

It is presumably to these two Transactions that he refers when he says, "You will see these things explained in *psychologice*." The two latter words have therefore been rendered, "In Our Psychological Transactions."

cal organs, or vessels. For the vital juice, or animal spirit, is conceived and brought forth in the cortical substances, which are so many most perfect chemical laboratories, or most simple of nature's glands. Following the medullary threads through the corpus callosum, and thence across the base of the fornix and along its pillars and roots, it is exuded into the anterior ventricles near the choroid plexuses; and, commingled with the lymph distilled in these plexuses, and by the ministration of glandular tubercles, it is led down through two foramina into the third ventricle; and so, through the infundibulum and the filter of its beak into the pituitary gland, and from this by the little sinuses and receptacles of the sella Turcica into the jugular veins. For the end that the blood, returning from the brain dry and languid, soon to be ingenerated with new chyle and to flow back into the right chamber of the heart, may be vivified with spirit. Hence also is derived the life of the blood whence is the life of the whole body. This, therefore, is the reason why the medullary globe of the cerebrum is distributed into so many members; of which the use of each will clearly reveal itself if we contemplate this machine as set in motion. For the whole mass, gaping with so many cavities and clefts, can readily rise up into a swelling, and alternately subside, or, it can be variously expanded and constricted. To this aforementioned laboratory and its chemical equipment, the fibre is drawn forth from the whole cortical circuit of the cerebrum.

Another kind of fibre of the same cerebrum, associated with the fibres of the corpora striata and the crura of the medulla oblongata, is sent out to the olfactory, the optic, and the other sensory nerves, building up these nerves together with their organs. All the remaining fibre is sent down, from the anterior part of the cerebrum, to the annular protuberance, and from its posterior part near the fourth ventricle to the medulla oblongata and beyond to the medulla spinalis; and is mingled with the fibres there originating, and also with fibres of the cerebellum, in order that it also may excite voluntary actions in the body.

From these considerations it is apparent that the fibre of which the medullary body of the cerebrum is fabricated is prin-

cipally devoted to three offices, namely, that it may conduct spirit and life to the blood; that it may transfer external sensations to the common sensory; and, lastly, that it may excite voluntary acts. But to trace out the origin whence the fibres of one function or the other spring, and, when this is found, the direction whither they tend,—this can never be detected without the guidance of ocular experience and of the experience of physical phenomena, combined with the conclusions of a rational and truly philosophic mind; nor can it be done synthetically before it has been done analytically.

75. In this chapter I have undertaken to treat of the terminations of the fibre in the Cerebrum, the Cerebellum and both medullas, the medulla of the head and that of the spine; that is, of the brains themselves and their members or organs. But I shall treat of them only in a limited way, for they will be explained more fully in the Transactions that are to follow.* For it is one thing to treat of the fibre, but another to treat of the determination of the fibre. The latter subject involves every structure and organism; indeed it involves the complete anatomy both of the brain and of the body. For there is not a thing in the anatomical system that is not fabricated of fibre, or of a stem sent out from the brains.

76. *The medullary and white substance of the cerebrum is seen to exist and find its origin in the confines and termini of its cortical substance.* For there are vascular shoots or arterial terminations, drawn from the meningeal surface of the cerebrum, which insinuate themselves around and through its cortical substance into its medullary globe and centre. These shoots, because they are emulous of the genuine fibre, are said *to exist in the confines* of the cortical substance. But there are also genuine fibres, namely, such as arise from the spherules of the cortical substance, as from so many little brains and hearts and as from their own proper matrices. These, there-

*The Transactions referred to are evidently the treatises on "The Cerebrum" and "The Cerebellum,"

which were to have been Transactions III and IV respectively.

fore, are said to find their origin in the termini of the cortical substance.

77. Hence the medulla is a congeries of mutually interwoven fibres, and little vessels, which connect with each other in various ways, though for the most part, after the manner of a network, and thus at intervals. Nor must we omit to mention that genuine fibres, rising from their parent cortex, often retain among themselves a distinction not unlike that which obtains in the cortical conglomerations themselves; namely, that in one place they run out in bundles, in another in layers, and in still another like foliage, as is especially apparent in dropsical and hydrocephalic brains, in which, by reason of the interjected lymph, the single divisions and connections come into view.

78. And it comes forth as a globe almost egg-shaped, or as a great medullary nucleus, called by the old anatomists the *Corpus Callosum*, and by the modern the *Centrum Ovale*. For with the removal of the cineritious substance which girds its trunk or nucleus like a rind, bark or shell, a purely medullary mass comes into view, similar in figure to the whole cerebrum. That this figure represents a great egg can be seen with the naked eye. But it is an egg almost divided into two halves; for the superior part, which is also called the posterior, is quite convex, while the inferior or anterior part is somewhat plane. Moreover, by the insinuation of the process of the falx, this medullary nucleus is hollowed out above, and thus divided into two hemispheres.

79. This globe is not a continuous globe, but is wonderfully divided up into members and cavities, such as eminences, tubercles, fornices, glandules, ventricles, aqueducts, fissures. Each of these has its own distinctive name; for they are called: the corpus callosum; the fornix with its base, pillars, fimbriæ and roots; the septum lucidum; the anterior, lateral or large ventricles; the foramina vulva and anus;* the tubercles which guard the entrance, such as the pineal gland, the testes and the nates; the isthmus, which is the plane in which these

*See note to n. 83.

tubercles are set. In the large ventricles are the corpora striata; the crura of the medulla oblongata, or the thalami of the optic nerves; through these ventricles runs the choroid plexus. From the third or middle ventricle is extended the beaked infundibulum, which is terminated in the pituitary gland. Not to mention the receptacula cavernosa,* the sinus of the sella Turcica† and of the base [of the brain],‡ the rete mirabile** and other parts, all of which will be treated of individually.

80. *Which, when deeply examined and weighed in the order in which they succeed each other and co-operate, indicate with some clearness that the cerebrum is a large gland, and a laboratory completely furnished with chemical organs or vessels.* This is according to the opinion of Hippocrates and the ancients, and also of Malpighi and many other more recent authors, all of whom assert that the cerebrum is a gland, and this not only in particular, but also as a whole. That it is indeed a gland will be seen in the Transactions on the cerebrum. In the meantime, when it is called a gland, a natural chemical laboratory is meant; for in the glands, animal nature, by secretion, excretion, commixture and cohobation, prepares her menstrua and juices,—as saliva, chyle, milk, bile, the genital fluid—with such science and so wondrously that art may regard its nature as everything, and itself as relatively nothing. The cerebrum is the very exemplar of all the glands of the body, than to search into which, nothing more delightful is offered. For here we meet with pipes, bladders, encased retorts, retorts that are serpentine, cups, filters, baths, and even vessels for cooling.

81. *For the vital juice or animal spirit is conceived and brought forth in the cortical substances, which are so many most perfect chemical laboratories, or most simple of nature's glands.* That such is the nature of this substance, is, I think, shown in Transaction II, in the chapter On the Cortical Sub-

*The cavernous sinuses.

†The circular sinus.

‡The transverse sinus.

**The ramifications and anas-

tomoses of the interior carotid and vertebral arteries at the base of the brain.

stance of the Brain; cf. nos. 110-132 and 165-176. That the animal spirit is the vital juice itself, see in a Transaction dealing with this spirit.*

82. *Following the medullary threads through the corpus callosum.* Immediately subjacent to the falx is a certain serpentine span, and, as it were, extended dorsum, purely medullary in composition, into which fibres are drawn, inflow and run together from the whole cortical periphery. This span or dorsum is called by Willis and other anatomists the Corpus Callosum, but by Vieussens the true Fornix. By means of it as by a bridge thrown between the two hemispheres, the medulla of one hemisphere communicates with that of the other; or, it is the combined containant of the medullary soil of both hemispheres. Moreover it is the threshold leading to the penetralia of the cerebrum itself. The fibre, led hither from every point of the cerebrum, is gathered into a peduncle called the base of the fornix. But the fibres compacted into this base or trunk are soon separated and unfolded over the thalami of the optic nerves in the lateral ventricles, like the roots or branches of a leafy tree, and are implanted in the thalami themselves near the choroid plexuses. Such is the passage of the fibres from the cortical circuit of the cerebrum, and such their unfolding; thus according to our description: *and thence across the base of the fornix and along its pillars and roots, it is exuded into the anterior ventricles near the choroid plexuses.*

(To be continued.)

*Many of the subjects which were to have been included in the Transactions of the Economy of the Animal Kingdom, were dealt with by Swedenborg at various periods, with greater or less completeness, and with the intention of subsequently incorporating them among the Transactions. These works have been preserved in MSS., and most, if not all of them, have been pub-

lished in the original Latin. Among them are the Rational Psychology, Ontology, Generation, etc., besides a number of smaller works, including one on the Animal Spirit. This latter seems to be a sketch of the Transaction referred to in the text. It may be found in English translation in the Posthumous Tracts.

THE SENSES.

CHAPTER VI. (*Continued.*)

431. *Their eyes must be very pure and very perfect because they are in a purer world.* 1. For there are insects which scarcely equal one degree of our sight, so that they cannot be seen except with a very good microscope. 2. There are also larger forms the eyes of which still are not seen without a microscope, but their eyes taken together present to our sight a confused mass, as, for instance, flies, bees, etc. 3. The objects which they see must be of a like degree, so that they may recognize the difference between the parts to which they apply themselves, 4. in order that they may pick out, choose, and take apart those things; that they may see particles, infinite in respect to the smallest part of our eye, from which they may pick out those agreeable to them; 5. wherefore they have been furnished with the smallest eyes, which can perceive those parts most distinctly, as do microscopes of a small sphere or diameter; 6. yet in order that they may see these things very distinctly, they are given many eyes which together perceive one thing; for the more organs there are, so much the more distinctly and exquisitely they perceive; many eyes are better than one. In purer nature forms which agree are multiplied; thus also one form keeps another in its own state. 8. Wherefore the organic forms of the brain are most numerous, likewise the organic forms of the body or of the smallest follicle, glandule or branch. 9. Every viscus derives its perfection from its smallest, and indeed its multiplied parts, those parts always having respect to motions. 10. Thus also they are safer from every danger and mutation, for they, at the same time, conserve one another, and guard the integrity of their form.

432. *Thence it follows that they see their objects at the shortest distance.* 1. This follows from their very small, as it were microscopic, spheres; 2. from the very near application

of insects to their food. 3. Thus they do not see colors as we do; for we see from the difference of many rays and from the ratio of light and shade in colors, while they see distinctly every ray whether luminous or shady. 4. This also appears in microscopes, in that many rays at once produce a color, but when inspected singly they show no such thing; 5. but rather every single part shows something luminous or dusky, which parts taken together produce something colored, as innumerable insects together, the parts of the blood, and many things of the vegetable kingdom inspected singly. 6. That which is white, becomes pellucid in a particle.

433. *Their sight seems to be effected in this way:* 1. Because there is a difference in all insects, for there is nowhere any greater difference than in the purest things of nature, for there nature is in its every sport of varieties, nor does anything hinder it. 2. Let us take only bees for an example; the eyes of other insects approach them in general, but are different in particular; then because bees are furnished with five eyes, but every eye is subdivided into many, 3. there is an altogether different structure from our eyes, but they agree in general with the rules of our sight, which have been treated of above. 4. One thing of perfection in them is, that they undergo changes of state more perfectly, because their affections are more perfectly excited, which affections are the causes of their instincts, and because their affections spring from their soul, in the nature of which there is nothing voluntary, thus there are perpetual changes of state, according to every mode and variety of sensation. 5. As to the progression of their sight it appears to be of this kind: 6. *first*, the rays pass through into their divided corneas, which being convex receive the rays as they are received in our eyes, but they receive more simple rays which they distinguish, and which larger eyes do not distinguish; a single ray of our sight is innumerable in their eyes, wherefore they see quite small things more distinctly than we. 7. *Second*, such a collection of rays in each division of the cornea, is received indeed by the underlying membrane which is called the uvula, (but it seems to

be rather the proximate involucre), which, according to the quantity and quality of light, is varied, is attenuated, becomes thick, is variously colored, grows red, grows green, is obscured, where also from the diversity of the colors of that uvea, (concerning which Swammerdam speaks), it is collected; furthermore, what in some is such an involucre, can in others be externally drawn over like an eyelid; in a word, lest the luminous rays rush in too much upon the tender contexture of underlying fibres without moderation; 8. *third*, these fibres are concentrated by the fibres or membranous fascicles which cohere to the uvea and cornea superiorly, and to the common membrane inferiorly, so that they seem to be membranous productions: in this respect also authorities agree, that is to say, that they cohere, that they are divided into fascicles, in imitation of certain living things in their optic nerves, where, although membranous convolutions appear, they are only to the end that the rays of every little eye may be concentrated, as in our eyes in the crystalline lens; wherefore they emulate our aqueous humor and the pupil, which there concentrates more perfectly and distinctly, for the concentration itself is so organically deduced that it may fall directly into the common membranous plane from every eye; otherwise from so many eyes there would not be a correct concentration; and lest the rays be dissipated, these membranous fibres are also stained with a like color as the uvea, namely, red, green, dusky, which colors will conveniently absorb all aberrant rays. 9. *Fourth*, in order that there may also be a convolution of the rays, or of the ether actuated by the rays, there are, round about these membranous fibres, as it were globular fibres, perfectly formed for the modification of the ether; thence there is a common modification round about, which contains the particular modifications within it; in order that all particular modifications may appear more distinctly, and may flow according to rule,—the common modification, which flows round about according to the gyration of its own nature, performs this office. 10. *Fifth*, Then the common double membrane receives it; this membrane receives the pure tremors of all the little eyes, thus

concentrated; this membrane is affected by that common tremiscence the more perfectly, since it is concentrated, and it comes from so very many eyes and concentrations. The common plane will receive as in larger eyes; wherefore this membrane performs the same office that the crystalline lens, and at the same time the vitreous humor, performs in the larger eye; wherefore that membrane is double and very thin, scarcely consisting of anything except of pulmonary tubules. It deserves to be observed here, that nature everywhere, even in the matter of sight, collects the first and the one of all things, and as it were, reduces it into a kind of chaos, before it separates and renders all things distinct; it pours them into a one in order that it may thence take out [what it chooses]; it is done thus in the viscera; in the other senses also all things are at first referred to a common membrane, as smell, to the pituitary membrane, touch, to the reticular membrane, so also taste. 11. *Sixth*, from this membrane every modification passes into the fibres of the optic nerve, which fibres also form pyramids, and under this membrane they are appended and are contiguous [to it]; thus every ray enters its own composition of rays, as has been observed of sound and of the retina; the cruder ray enters many fibres at once, the thinner and simpler rays, fewer fibres; this is the first distinction and unfolding of the rays from this common chaos of concentrations. 12. *Seventh*, in these optic nerves, which are also multiplied, but not like the eyes and their pyramids, [but rather] like little organs not dissimilar to those in our own retina or in the cortical substances of the brain, (to which also Swammerdam likens them), which receive the rays and thus distinguish them, there is this other distinction and purification of the rays; almost as in the ear, the modifications of which also in general agree. 13. *Eighth*, from these little organs the optic nerves tend through the fibres to the brain, and indeed immediately into the cineritious substance, where the fibres terminate, and the little organs of which correspond to the little organs of the optic nerve; this is the last purification and distinction of the rays. 14. Thus sight seems to be effected in the bee, and in

other insects similarly in general, and thus more distinctly than in larger and binocular animals. These are the successive things which appear here congested into one globe and thus simultaneous. The structure can be varied in an endless number of other ways, altogether according to use; for nothing hinders in nature, when the purest essences intend an end; all things then accommodate themselves to it; for the world and nature were thus and hereunto made, namely, in order that they may be obedient to spiritual potencies in all things, and thus the natural world as an instrumental cause be subject to the spiritual world as its principal cause. The spiritual world of insects resides in their brains; the organic forms round about are constructed entirely for the ends of that world.

434. *From the above observations it would appear, that the brain of insects is moment by moment affected according to all the harmonies of rays, which harmonies agree with the nature of their soul.* 1. For every single least ray selects its own fibres or rather collection of fibres, 2. and it modifies them suitably. 3. The fibres likewise select their animal spirit and the principal or cortical substance of the brain; 4. wherefore the whole brain selects. 5. The brain cannot but harmonically consent to everything which agrees with the spirits, that is, the soul of those fibres, wherefore which agrees with the blood. 6. Every instinct, appetite, and aversion of what is good and evil, in respect to their known nature, arises from that affection. 7. Sight is their last and inmost sense, in place of our understanding; insects are excited in spite of themselves; wherefore eyes in brutes are, as it were, succenturiate brains; they are still more numerous in insects; in which they occupy the whole circumference, and make one thing with the brains, which are only a central nucleus; thus they coalesce with the brains. 8. Furthermore, there seems in other animals to be a kind of imagination, or an iterated composition of images, whence are imaginative or material ideas, thus in a certain successive form; but in insects there is no imagination, but only an action of the rays, which affect the brain im-

mediately, wherefore the mass of the sensory of sight, is so greatly enlarged and constitutes the external brain itself. Affections in other animals are from a higher principle, but in insects they spring from the eyes alone, in order that they may be entirely subject to the influx of the whole world: this also is the reason for so many eyes, and there is an exquisite operation of the rays, different from what it is in other animals, and different from what it is in man who is gifted with understanding. Thus from the eyes one can conclude comparatively as to the brain, what quality of sensation each one has, wherefore what grade of understanding. 9. Therefore the sight of insects is guarded, lest any rays enter towards the brain other than those which must be doubly purified and distinguished, wherefore there is a red (*purpureus*) color in the uvea, and in the first collection of the rays. 10. Therefore the eyes are scattered about as in flies, so that they can look in every direction, according to the observation of Leeuwenhoek; so that there is nothing in the vicinity of the parts which does not at once affect them.

435. *From this affection results a sudden change of the state of the organs, according to every affection of their brain.*

1. In the purest parts there is a most perfect change of all states. 2. Their perfection consists in this potency. For thence results instinct or natural action according to the mode of the affection. 4. That these organs are fashioned for all changes of state, appears, both from the very thin and very pure membranous fibres of the brain, and from the softness and elasticity of all of them. 5. Therefore the uvea and its appendix can change themselves very quickly, and perchance also their colors. 6. Therefore there is a surrounding globular matter, through which the ether circulates and to every part of which it is concentrated, which matter from the common affection induces changes of state upon those included fascicles; for they consist of that most perfectly mobile substance, and are divided into expansible, compressible and erectile (*elevabiles*), spherules; this is the change of the general affection. 7. There is an underlying common membrane, into which are

concentrated the rays of all the eyes still more and more generally, for it serves as a basis for all, and can be contracted and dilated and can thus variously expand the whole organ; wherefore it is very thin, furnished with a double layer, produced almost from pulmonary fistulæ, which, according to Swammerdam, can contract and expand it; *for almost every general change of state in insects is brought about through the pulmonary fistulæ.* 8. Indeed those fistulæ come out to the surface and to the eyes, according to Swammerdam, in order that they may induce a similar state upon all parts, or in order that particular states may correspond to the general. 9. There are two extremes and two origins of changes of state: 10. They come from the influx of rays or of sight, which induces the first state; 11. they come afterwards from the harmony of the sensations in the brain; 12. in like manner as has been observed in man. 13. These mutations concur in the common membrane between the brain and the eye, and they thus make one thing. 14. Wherefore that membrane is double, one layer of which has respect to the optic nerves and thus to the brain, the other layer of which has respect to the eyes. 15. Thence it appears how exactly the two affections concur, and produce the instincts or acts of nature in insects.

436. *But in order that instincts may come forth and their animal nature be ruled by them, which nature has respect especially to nutrition and to the blood, it is also necessary that the other senses should concur in the same sense, nor should they be separated, as, for instance, smell and a rude kind of hearing. As to what respects smell, it is to be observed:*

1. That this conjoined with sight and taste especially produces affections, and these latter changes of state or instincts particular and general. 2. Because animalcula are simpler, smell and sight concur in one organ; 3. for organs of smell are nowhere detected; 4. but from the phenomena and causes of smell, which is a subtle touch, it is clear that they concur. 5. That bees smell what is to be desired in rose-gardens is clear; it is clear that the like happens in flies and similar insects which fly to volatile putrid substances; and in other flies

which fly to the place of effluvia, etc. 6. Smell is only a subtle touch, or a sense of the more subtle particles flying in the atmosphere, as those of effluvia. 7. Insects perceive still more subtle and volatile elements, for these agree with their life and their blood. 8. The corneal membrane is sensitive, every most minute touch affects it, 9. according to the figure of the impression in the compound. 10. It refers to the circumferences and interstices, where there are cilia, the roots of all of which are exquisitely sensitive; 11. thus similarly a tremiscence thence arising passes through those continuous pyramids to the basic or common membrane, 12. and thus by another mode with every figure of the parts to the brain.

437. *The ruder touch is similar.* 1. It cannot be doubted but that the cornea is sensitive, since our eye is sensitive; 2. and if anything touches the cilia, especially their roots, a continuous sense of touch is thence spread to all the parts, 3. and likewise to the common membrane.

438. *Hearing is here similarly concentrated.* 1. That bees hear is evident from the outcry of their queen, the sound of which they hear; 2. it is evident from the tremor of the air, that it vibrates all this ocular structure; 3. from a similar spreading to the common membrane and thus to the common sensory; 4. from the agreement of sight and hearing in themselves, for the modifications of it differ only in degree, that is to say aerial modification touches and vibrates the mass or the fascicles of the fibres, while the ethereal modification touches and vibrates only the mass or fascicles of the parts,—this is the only difference. 5. From things described it is evident that the organ of sight of insects is a common external sensory, wherefore it is so constructed. 6. From the senses it likewise becomes clear that they agree in general, and that they differ only in degree and quality. 7. Thus this whole mass is, as it were, an external brain; that it is so prepared that it can receive and carry away all sensations to the interior brain. 8. From these things it is evident what the senses have in common with one another.

439. *From these things it also appears that every sense is*

referred to every fibre and cortical substance, which is the common sensory, and not to corresponding and certain fibres.

1. For all the rays are brought to the common membrane; 2. thus into all the fibres of the optic nerve universally, according to degrees, 3. thus into the whole medullary and cortical substance of the brain; 4. still better in the beetle, (see Swammerdam), where two eyes, larger than the optic nerves, traverse the whole brain and communicate with the whole fibre and cortex, nay, more, with the cerebellum and medulla spinalis. 5. In the bee the brain seems to occupy the exterior part, and the mass hidden within again refers to the cerebellum which disposes the instincts, and communicates with the other little masses of the medulla spinalis, (see the figures). Thus it is so aranged that no fibre of the cerebrum, the cerebellum or of the medulla spinalis is devoid of sensation. 6. Thence results the general affection, 7. and thence is general change and instinct. 8. But because no cortical part is absolutely like another, so one part sensates more exquisitely than another; thus one region perceives the phenomena of sight more exquisitely, another those of hearing or smell, according to accidental varieties; 9. but this does not hinder every cortical substance becoming the consort of every sensation. 10. This harmony of varieties must be explored in order that this science may be deeply explored.

440. They also recognize dangers or perils, 1. by the cilia; 2. for when the cilia are touched they vibrate the whole machine, and as it were hurt it. 3. Their sight seems to be extended even to the extremities of the cilia, because they sensate objects striking there which they perceive by the sense. 4. Wherefore the cilia are in the interstices, and being touched cannot but connect that whole series.

441. These things may be said in place of an epilogue, where common criteria and the agreement of all the senses are treated of, all of which is perfectly represented in insects.

442. Finally all diseases of the eyes are reviewed from two authorities, namely ——— and Boerhaave, see my dictionary, pp. 43, 44, 45, 46.

443. In the epilogue are reviewed generals, all of which could be evolved into vast volumes, if they should be treated in particular, especially if they should be treated geometrically; they can be so treated that they scarcely fall into the understanding, for with particulars you can overshadow the understanding, and by applications increase the work into a volume:

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CHAPTER VII.

Epilogue concerning the Senses or Sensation in General.

444. 1. These generals are to be observed concerning all sensation: 1. That the origin of all sensation is from touch or external impulse; 2. that touch or impulse is into the fibres or the tunics of the fibres, thus external. 4. Wherefore the fibres must be so organically arranged and formed that the touch of each one can distinctly receive the differences of that kind. 5. The sensations of touch, taste and smell arise from a touch or impulse of heavy particles, or of the inertia of the forces, that is of the parts. 6. But the sense of hearing and of sight from a touch or impulse of particles not heavy, but of active force, that is of particles of the atmosphere. 7. In order that sensation may come forth evident and affecting, there must be many differences at the same time in one touch, thus a kind of form of differences. 8. The differences of this form must be simultaneous or successive: 9. a form arising from things successive takes on the same quality as a form of things simultaneous. 10. That organico-sensory forms were made to receive distinctly the forms of such differences.

445. 2. It is moreover to be observed: 1. that the organic forms of every sensory exactly apply, to themselves, these varieties of differences, both simultaneous and successive. 2. They communicate those varieties with the fibres of which they are made up; 3. which fibres by a kind of modification or tremiscence, after the analogy of chords, carry them away, along the antecedents, towards their beginnings or the cortical substances, 4. and that, indeed, most perfectly, by the assistance (*beneficio*) of the spiritual essence which is within the fibres, 5. and indeed according to the nature of the modification or tremiscence, into every contiguous fibre, thus into the whole cortical substance of both the cerebrum and cerebellum, also of the medulla oblongata and of the spinalis, according to the contiguity of the fibres on the way. 6. From the living essence which is within the spirit and the fibres modification becomes sensation; change of state becomes affection; according to the form of the modifications, and so forth. 7. According to affections arise changes of state in the organs.

446. 3. 1. This modification of the fibres in their very beginnings or in the cortical substances goes forth on all sides according to their every form, for those beginnings or cortical substances are formed according to the whole nature of modification. 2. Thus as many as are the differences and as many as are the varieties in the touch, and between the touches, so many diverse changes of state do they undergo; for in this consists their perfection. 3. From the form of the differences, of the modifications, and the thence arising changes of state, arise affections: thus grateful affections if they agree with their natural state, ungrateful if they disagree. 4. Hence every touch or mode, which is represented as a unit in the sense, whether the varieties enter simultaneously or successively, is either grateful or ungrateful. 5. It is similar with unities or modes among themselves.

(*To be continued.*)

THE NEW PHILOSOPHY

A QUARTERLY MAGAZINE
DEVOTED TO THE INTERESTS OF
THE SWEDENBORG SCIENTIFIC ASSOCIATION

VOLUME XIII

1910



THE SWEDENBORG SCIENTIFIC ASSOCIATION,

PHILADELPHIA,

1910

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(1898—1910)

BOUND IN VOL. XIII

(1910)

14

THE NEW PHILOSOPHY.

VOL. XIII.

JANUARY, 1910.

No. 1.

Editorial Notes

THE NEW YEAR.

The editor must apologize to his readers for the late date at which this number of the NEW PHILOSOPHY will come into their hands. The delay has been unavoidable, owing to a united press of other duties, but it is none the less regretted. However, although we do not come out on New Year's Day, we can still extend to our readers our hearty wish that they may have a happy and prosperous New Year.

New Year's Day brings different thoughts, retrospective and anticipatory, to different minds. To the mind of the writer it has brought some reflections on the progress of the SWEDENBORG SCIENTIFIC ASSOCIATION during the past year and its hopes for the present. And while neither the looking back nor the looking forward have produced in the editorial mind any startling elation of spirits, yet on the other hand, they give no cause for dejection.

During the past year the treasurer of our Association and the editor of the NEW PHILOSOPHY have acted in conjunction with a view to extending the uses of the ASSOCIATION. A printed circular was issued and sent to about one hundred and fifty addresses, and advertisements of both the ASSOCIATION and its official organ, were inserted in three of the New Church papers having the largest circulation. These steps, while they have not given brilliant results, have yet not been wholly

barren of results, for a few more members—though very few—have joined the ASSOCIATION. It is to steady increase, however, that we must look for solid growth; and in the proper carrying out of our uses and with the co-operation of our members, we may hope for a continuation of this increase,—if not an acceleration—during the coming year.

A REQUEST FOR SUGGESTIONS.

Our readers, we presume, are aware of the fact that the translations of Swedenborg's works now appearing in the NEW PHILOSOPHY are all held in type for reprint in book form. The present plan is to print off, for future binding, a fascicle of sixteen pages of both THE FIBRE and THE SENSES as they appear. Four fascicles of the latter work have already been printed, and we hope in our next issue to announce the printing of other fascicles, and also to offer them for sale at a low cost. In the meantime we would invite the more learned of our readers to send us such suggestions as may occur to them, either in the way of criticisms of the translation and suggested improvements, or, of elucidations of the text, which might be added in the way of footnotes to the translations.

THE WORK ON GENERATION.

Since our last issue there has been a steady increase in the number of subscriptions for the forthcoming new edition of Swedenborg's work on GENERATION. We say "forthcoming," because the work is now assured beyond doubt,—the present number of subscriptions being considerably over the number originally required. The revision of the translation has already been commenced, and it is both Dr. Boericke's wish and his expectation, that the book shall be in the hands of subscribers by Christmas, 1910.

Our English contemporary, THE NEW CHURCH QUARTERLY,—born on January 1, 1910,—in its notice of the list of subscribers printed in the NEW PHILOSOPHY for October, notes "with some surprise" that the list "does not include one single

name from this side of the Atlantic. Yet (it continues), there are surely many Newchurchmen in this country who only need to know of such an enterprise, to be eager to give it all necessary support."

The absence of subscriptions from England, it may be noted, is somewhat remedied in the additional list which we give below.

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THE FIBRE.

TRANSLATED BY THE EDITOR.

CHAPTER II. (*Continued.*)

83. *And, commingled with the lymph destilled in these plexuses, and by the ministration of glandular tubercles, it is led down through two foramina into the third ventricle.* Between the large cavities of the cerebrum, called the lateral ventricles, is a long but expansile cleft, or third ventricle, below which the lymph channel is continued to the great valve,* which is followed by the fourth ventricle and the calamus scriptorius carved in the stem of the medulla oblongata. This cleft or third ventricle, rising not far from the fissure between the bosses of the cerebrum, is continued as a hollow axis running through the middle of the septum lucidum, under the forked base of the fornix, and the corpus callosum, and between the crura in the medulla oblongata, to the beginning of the medulla spinalis, though it is intercepted by barriers. The foramina which lead into it from the lateral ventricles are called by the old anatomists the vulva and anus.† The gland-

*The valve of Vieussens.

†The vulva and anus, called by Winslow the common anterior and posterior foramina, are two openings between the lateral and third ventricles. Both were well known to Swedenborg's contemporaries, and even to the ancients, but soon after Swedenborg's time the knowledge seems to have been generally lost. Haller, in 1762, denied that there was any communication between these ventricles; but in 1783 Monro conclusively demonstrated the existence of the anterior foramen or

vulva, which has since been known as the foramen of Monro. This anatomist, however, denied the existence of any posterior communication between the lateral and third ventricles. But in 1872 the existence of this also was clearly demonstrated by the researches of Mierzejewsky, whose discovery, however, seems to be unknown, or at any rate unnoticed, by modern anatomists. Mierzejewsky's injections showed that there was a posterior foramen in the lateral ventricle in the neighborhood of the pineal gland. That

ular tubercles which minister, and guard, close, and open the way, are the pineal gland, the nates and the testes.*

84. *And thus through the infundibulum, and the filter of its beak into the pituitary gland, and from this by the little sinuses and receptacles of the sella Turcica into the jugular veins.* In the middle of the floor of the third ventricle is extended a coniform cavity, called the infundibulum, whose beak or apex is inserted into the pituitary gland. This beaked extremity of the infundibulum appears to be impervious both to injections and to the lymphs in the human brain; hence the opinion has arisen that the animal or most purely vital juice cannot pass through it. The pituitary gland is set in a little hollow in the centre of the sphenoid bone, and this in such a way that it can be freely expanded in its saddle in every direction. Into the middle of this gland girt with its bony wall, and around it, open the most subtle passages running from the infundibulum through its beak. And, again, there are apertures leading from the middle of the gland and from the space around it, into little sinuses, the receptacula cavernosa and the bones of the cranium, and, from these, into the lateral sinuses and the jugular veins which take up all the blood of both cerebra and carry it back to the heart. Such is the continuous connection of the members and cavities of the cerebrum, and that such also is the flow of the spirits cannot be doubted. In the *Transactions ON THE BRAIN* it will be shown that the spirit, which is most volatile, when it leaves its fibres, must be taken up, and, as it were, fixed in the ventricles by a lymph secreted from the choroid plexuses, lest it be evaporated. And then it must be

this foramen is identical with the anus of the ancients is evident from the descriptions. Vieussens describes the anus as being under the base of the fornix near the anterior tubercle of the corpora quadrigemina. Ridley gives the same description, placing the foramen under the pineal gland; and Winslow describes it as the interstice

where the two anterior corpora quadrigemina join the convexity of the optic thalamus. See an interesting discussion of this whole question by Dr. R. L. Tafel in his translation of *The Brain*, Vol. I., pp., 751, *seq.*

*Called also the quadrigeminal bodies, the nates being the superior and the testes the inferior.

filtered and purged by passage through the beak of the infundibulum, in order that the better essence may penetrate the pituitary gland, and the rest, flowing into the space by which that gland is surrounded, may be derived by divers paths into the venous blood. "Does it then seem strange to you (says the illustrious Boerhaave) that the eye does not take in the presence and motion of this humor? that ligatures, wounds, punctures, suction, air-pumps, and injections are of no avail to exhibit it to the eye? that by no art can the cavities of the nerves be set before the keenness of its vision? He who attempts these things with this intention, truly knows nothing of the nature of these vessels and of the liquor itself. But he who, because they flee the sight and elude all skill, therefore denies the existence of cavities in these little vessels, is wholly ignorant of the rationale of our body in its origin, its progress, its operations, and its excretions; neither does he know the structure of insects, nor attend to all that so manifestly takes place in plants. This humor, by reason of its perfect simplicity, mobility and volatility, we call the Spirit of the nerves, — a spirit which is natural, vital and animal." (*sup.* n. 51.)

85. *For the end that the blood returning from the brain dry and languid.* It is known that the better blood is withdrawn towards the brains, or to the supreme court of the body and presence-chamber of the soul, and is there devoted to its rational functions; yea that the spirit of the dissolved blood is again poured into the fibres; cf. Trans. II, nos. 117-132. That this spirit is the principal substance entering into the composition of the blood, see Trans. I, n. 37, 38, 40, 41, 91, 97, 100, 190, 271, 503, 556, 634. Hence it follows that in the brains the blood is despoiled of its spirituous nature and essence; and, therefore, its residual part comes forth quite dry and languid. That the fluidity of the blood results from its spirit, see Trans. I, n. 102, 556. Thus, unless it be refreshed with an abundant supply of new spirit, it would become wholly torpid and unable to descend through the jugular veins. Hence would arise obstruction, the loss of sensations, of memory, and of voluntary and natural actions, the cessation of respiration and pulsation, in a word, inevitable death.

86. *Soon to be ingenerated with new chyle, and to flow into the right chamber of the heart, may be vivified with spirit.* As soon as the jugular vein containing the blood of the cerebrum is implanted in the subclavian, new chyle runs to meet it through the thoracic duct, and unless a better blood, or one impregnated with spirit, were at once poured in, the fluid would become sluggish, and, with elements crude and not of themselves fluent, would stop up, not only its own veins, but also the right auricle and ventricle of the heart. This danger, therefore, is avoided by the pouring in of spirituous blood. *Hence also is derived the life of the blood, whence is the life of the whole body. This, therefore, is the reason why the medullary globe of the cerebrum is distributed into so many members.*

87. *Of which the use of each will clearly reveal itself if we contemplate this machine as set in motion.* On the systole and diastole, or animation, of the cerebrum, see Transaction II, chapters I and II, and especially n. 132-147; see also above, n. 68-74. It is almost the same as with the rationale of the pneumatic machine; unless you have seen this machine set in motion you will hesitate for a long time as to the use of the shafts, and screws, and their attached levers and ropes. So also is it with the brains.

88. *For the whole mass, gaping with so many cavities and clefts, can readily rise up into a swelling, and alternately subside; or, it can be variously expanded and constricted.* The cerebrum is a machine in motion and conformed and wholly adapted to motion, or to the faculty of expansion, both in general and in every particular. *In general;* for there is a space between the two meninges, the thick and the thin; there is a space between the convolutions called anfractuositities; there are little fossæ and furrows about every congeries of the cortical substances in particular; there are cavities deeply set in the medulla itself, namely, the three ventricles with the other continuous passages. Thus the cerebrum is given the faculty and the opportunity of swelling and unswelling both towards its exteriors and towards its interiors. *In every particular:* There are little spaces and clefts about every cortical spherule; the

same are found between every least and compound fibre, for they are connected together after the manner of a network. This is the reason why each single part of the cerebrum is seen to be evidently set in the stream of the motion of all the parts; see above, n. 68 to 74. It is moreover necessary that the cerebrum be formed to this expansibility, for without actual motion or an active force in causes, nothing of the blood would ever be withdrawn from the kingdom of the heart, *i. e.*, from the body; nor would the spirits be poured through the fibres into the lower provinces; thus neither would the lungs breathe, nor the arteries and heart pulsate. If the fountain be still how much more the streams and brooks? If causes cease whence shall come effects?

89. *To this aforementioned laboratory and its chemical equipment the fibre is drawn forth from the whole cortical circuit of the cerebrum.* We have now treated of the determination of those fibres which are expended on the chemical members and operations of the cerebrum. The remaining fibres of which we now treat are not drawn to the corpus callosum, and through the base of the fornix to the ventricles, but, at once associated with the fibres of the head of the medulla oblongata, they gird themselves for the performance of other uses.

90. *Another kind of fibre of the same cerebrum, associated with the fibres of the corpora striata and the crura of the medulla oblongata, is sent out to the olfactory, the optic and the other sensory nerves, building up these nerves together with their organs.* The olfactory nerves, or mamillary processes,* which are affixed to the anterior face of the cerebrum like two bottles, take their widely scattered roots from the region of the corpora striata. The optic nerves take their roots from the crura of the medulla oblongata, also called the thalami of the optic nerve; the auditory or seventh pair† from the annular protuberance, which is also the origin of the gustatory or fifth pair; the nerves of touch from all the nerves of the medulla spinalis. All these nerves build up, in their extremities, organic forms corresponding to the degrees, meas-

*The olfactory bulbs.

†Now called the eighth pair.

ures and laws of the modes and forces flowing into them, or of the contacts [of these forces].

91. *All the remaining fibre is sent down, from the anterior part of the cerebrum, to the annular protuberance, and from its posterior part near the fourth ventricle, to the medulla oblongata and beyond to the medulla spinalis; and is mingled with the fibres there originating and also with fibres of the cerebellum, in order that it also may excite voluntary actions in the body.* The ocular experience of Vieussens, Willis and other anatomists tells us of the emigration of fibres from the cerebrum to the medulla oblongata and medulla spinalis and of their consociation with fibres of the cerebellum; and the physical and theoretical experience of phenomena confirms them. For voluntary acts wheresoever they are excited do not exist except with deliberation, and the assent and imprint of the cerebrum. For endeavors to action, or active forces, before they break out into ultimate act must descend from the peripheries like heavy bodies, according to the theory set forth above, n. 65. Therefore, the fibre of the cerebrum is never sent away singly except to its first functions or chemical operations, of which we have already treated; consult the illustrious Boerhaave quoted above, n. 46, 47. *From these considerations it is apparent that the fibre of which the medullary body of the cerebrum is fabricated, is principally devoted to three offices, namely, that it may conduct spirit and life to the blood; that it may transfer external sensations to the common sensory; and, lastly, that it may excite voluntary acts.*

92. *But to trace out the origin whence the fibres of one function or the other spring, and, when this is found, the direction whither they tend—this can never be detected without the guidance of ocular experience and of the experience of physical phenomena, combined with the conclusions of a rational and truly philosophic mind.* For in the cerebrum all things appear soft like paste, coherent like a knotted mass, inextricable alike to the stylus, the scalpel, and the eye, even when this is armed with the microscope. Moreover the fibrous structure, collected into molecules and globules, and partly also into fascicles, runs together under the finger at the

slightest touch. Wherefore we must betake ourselves to experimental phenomena; for, to men of a penetrating genius, the effects springing from the modifications of fibres or of organic forms in the extremes, and corresponding to the primes in their natal soil, indicate with some clearness the action and passion of the mediate fibres, and whence these fibres come and whither they go. But there is need of much investigation and rational intuition.

93. *Nor can it be done synthetically before it has been done analytically.* There are two ways and methods of opening and exploring nature,—the analytic, which consists in judging and concluding origins, causes, and principles from phenomena, effects and experience, that is, *ex posteriori*; and the synthetic, which consists in judging effects and phenomena from causes and principles, that is, *ex priori*. The former method is familiar to human minds because it is the natural method; for, as we grow up, we ascend to the sciences, and to our reasonings and judgments by the path of the senses whereby phenomena are received. But the latter method is proper only to pure souls and to spirits separated from the body,—a method to which we approach with maturing years so far as we recede from the body. Therefore he who, as though he were divinely inspired, starts immaturally and precociously to at once reason concerning the unseen things of nature from principles not explored by the analytic way or by experience, readily seizes upon empty shades and fashions out spectres of whom nothing but the like is begotten. So long as we live in this lowly nature we must first ascend before we can descend; for as we were cast down from heaven where are the principles of things to the earth, so must we strive thither before we speak from principles. This, then, is the reason why, in our Transactions, I have labored to direct myself analytically from premised experimental proofs, or *ex posteriori*, to causes and principles, before I dared to descend synthetically, from principles, or *ex priori*, to effects. This is the true art and method of dialectics, or of drawing conclusions, for “He is a dialectician who looks into matters accurately and has penetration into the nature of the things concerning which judgment is to be made.” (Plato, De Repub: lib. VIII, [?VII].)

III.

ON THE DETERMINATION OF THE MEDULLARY
SUBSTANCE IN THE CEREBELLUM.

93a. *The medullary, or white substance, in the cerebellum is not conglomerated into an ovi-form nucleus, like that of the cerebrum, cut up into distinct members and cavities; but, from a somewhat ample space, it finally coalesces into a trunk, called a peduncle, made up mainly of three, as it were, arboreal stems or lesser trunks. This peduncle into which all the fibres of the cerebellum are gathered together from the peripheries, here and there, is planted on both sides in a cleft called the fourth ventricle and calamus scriptorius. From this ground it unfolds its fibres like roots, and sets them free in every direction, by three bundles, called processes. The first process goes to the opposite region, that is, to the annular protuberance; the second to the superior region where are the testes; and the third, called the restiform body, to the inferior region toward the medulla spinalis. All these fibres of the cerebellum, thus spread apart, meet and entwine themselves in the fibres of the cerebrum and in the fibres proper to the two medullas; and thus they gird themselves for performing their offices in the head and body, both distinctly and conjointly. This globe, although a continuous structure, is still given the unimpeded faculty of expansion both lengthwise and breadthwise, and also in general and in particular. For, besides the space between the meninges, its surface is divided into deeply furrowed layers, or into little rings; of these, the upper, stretched breadthwise, refer themselves to a certain corrugated axis, called the vermicular process, and from this to their poles, while the lower, drawn obliquely and lengthwise, refer themselves to a similar corrugated process in the inferior part of the cerebellum, situate transversely to the former.*

Meanwhile, the position and foldings of the vermicular process, the insinuation and direction of the furrows, and, moreover, the actual existence of poles in the surface, all lead to an indubitable conclusion as to the nature of the mode of the

expansion and of the form of the motion; namely, that it twists itself after the manner of a perpetual circle, that is to say, spirally. On this account there are pivots, axes and poles, all of which necessarily suppose and thus indicate the existence of a spiral flux. Moreover, the peduncle, towards which the forces of the whole mass are inwardly directed, is attached to an expansile cavity, carved in the stem of the medulla oblongata.

From these considerations it can be seen that the cerebellum is one grand bed of cineritious and medullary substance, which by the forces of its animation pours a copious and continuous stream of spirits into all its nerves, and through these into the organs, glands and muscles,—and this constantly and in a single manner. Hence come forth natural actions and the stupendous operations of animal nature; for every single bud of this tree looks to its twig, the twig to its branch, and the branch to its trunk; so every particle of the cineritious substance looks to its fibre, and all together to the stem, made up of fibres, which the cerebellum, at every alternation of its expansion and constriction, leads to and fro in the yielding ventricle below.

94. *The medullary, or white substance, in the cerebellum is not conglomerated into an ovi-form nucleus, like that of the cerebrum, cut up into distinct members and cavities; but, from a somewhat ample space, it finally coalesces into a trunk, called a peduncle, made up mainly of three, as it were, arboreal stems or lesser trunks. There is indeed a medullary space in the cerebellum, which, when cut across, presents a somewhat broad area, called by Vieussens the semicircular centre of the cerebellum; for here, as in other places, the newborn medullary substance first expands, and, as it were, unlooses before it comes together and is constricted. What should be noted is that there are three little trees which coalesce and unite together into one stem or peduncle, as is clearly seen from the figures of Heister* and other anatomists; there are also three*

*Heister delineates a human cerebellum, and also the cerebellum of a calf, both cut into

the junction of three main stems. The same is true of the human cerebellum but here each of the

processes, (spoken of below), which go out from the united stem and proceed to their ordained provinces. There is ground, therefore, for supposing that each process springs from its own particular tree.

95. *This peduncle into which all the fibres of the cerebellum are gathered together from the peripheries, here and there, is planted on both sides in a cleft, called the fourth ventricle and calamus scriptorius.* It is fixed in the borders of this cavity, and this for a reason of which we shall speak below. In defunct and collapsed brains this cavity appears like a cleft, but in living and animate brains, when they are in the vigor of perpetual and alternate motions, it is seen to be both able and accustomed to expand into an oval gap and cavity. Its superior part, which lies next to the great valve of the cerebrum* and closely subjacent to the vermicular process, is called the fourth ventricle, while the inferior part, verging towards the great foramen of the occiput, by reason of its shape, is called the calamus scriptorius.

96. *From this ground it unfolds its fibres like roots, and sets them free in every direction, by three bundles, called processes.* In the animal kingdom and also in the vegetable, yea, in universal created nature, it is nature's constant rule that singulars and particulars are reduced to some universal and general unit before they go off to their parts, *i. e.*, before they diffuse themselves; and this for the end that the scattered parts, each of which carries its own nature and its own mind, may perpetually refer themselves to the commonwealth, or the single members to the united city; thus, and in no other way, do the parts breathe in common, and unanimously look to one end. So also is it in the cerebrum, where the scattered fibres of the peripheries are gathered together, first, into the corpus callosum, and from this into the base of the fornix, that is, into a similar peduncle, before they are dismissed to their own

two halves by vertical section. In the calf, the medullary nucleus is clearly depicted as formed from three stems becomes divided in close proximity to the medullary

nucleus. See Heister, *Comp: Anat:* Tab. IV, Fig. 16, 17.

*The Posterior Commissure at the head of the Aqueduct of Sylvius.

colonies. The like also obtains in the nerves. For the present, the loose and scattered character of the medullary structure, in both the cerebrum and the cerebellum, may be sufficiently inferred from the fact that the entire globular mass, expanded into so great a space, suffers itself to be contracted into a narrow stem.

97. *The first process goes to the opposite region, that is, to the annular protuberance; the second to the superior region, where are the testes; and the third, called the restiform body, to the inferior region toward the medulla spinalis.* But the manner in which these radical fibres branch out cannot well be seen without some representation of them in plates or an inspection of the living brain. The reader, therefore, should consult [anatomical] treatises.

98. *All these fibres of the cerebellum, thus spread apart, meet and entwine themselves in the fibres of the cerebellum and in the fibres proper to the two medullas, and thus they gird themselves for performing their offices in the head and body both distinctly and conjointly.* It was pointed out above [n. 90, 91] that the fibres of the cerebrum associated with the fibres of the superior beginnings of the medulla oblongata pass out from the cerebrum anteriorly toward the annular protuberance, and superiorly to the neighborhood of the testes. Hither, also, come the fibres of the cerebellum, so that they seem predestined to be carried into the embrace of the approaching fibres of the cerebrum. In the annular protuberance, the fibres curve themselves into continual semicircles, but under the testes they form a girdle, whereby they constrict, as it were with a bond, that medullary tract which is the central portion of the whole encephalon. But whither they betake themselves after this, escapes even the keen sighted; we must suppose, however, that they go partly into the sensory and motor nerves of the head, and partly to like nerves in the medulla spinalis,—a supposition which is confirmed by experience. The same opinion is also entertained by Boerhaave, who says: "We may well believe that the medullary fibrils of the cerebellum—a body whose medulla gives forth no nerve—ascend upwards from a situation beneath the

commissure toward the anterior parts of the medulla oblongata and there give to the nerves rising from the cerebral medulla, certain fibres of the cerebellum, the distinction, origin, progress, and office being always accurately preserved. . . . The other fibres of the cerebellum are so mingled with the fibres of the cerebrum that there is perhaps hardly a part of the whole medulla oblongata and medulla spinalis, where fibres of the cerebrum and fibres of the cerebellum are not found mingled together; so that, in the composition of the nerve, they are everywhere concurrent for the production of diverse and distinct effects" (*sup.* n. 48).

99. *This globe, although a continuous structure, is still given the unimpeded faculty of expansion, both lengthwise and breadthwise, and also in general and in particular. But by what wonderful nature and art, will be seen in what follows. For, besides the space between the meninges, its surface is also divided into deeply furrowed layers, or into little rings. Of these the upper, stretched breadthwise, refer themselves to a certain corrugated axis, called the vermicular process, and from this to their poles, while the lower, drawn obliquely and lengthwise, refer themselves to a similar corrugated process in the inferior part of the cerebellum situate transversely to the former.* The superior part of the cerebellum, underlying the postreme lobes of the cerebrum, is comparatively depressed and smooth, but when we come to the inferior and anterior part, the curves become more rounded and the cerebellum there assumes almost the shape of a globe. When the surface of this portion of the cerebellum is exposed up to the first meninges, there comes to view an appearance and arrangement of little rings into which the surface is plowed. In the superior surface these ridges or furrows are somewhat removed from mutual contact, but in their progress forward to the sides and towards the base of the brain, they closely approach each other and there insert themselves in other fissures, which, after making some wonderful curves and contortions, terminate around certain slightly elevated protuberances, which induce on the furrowed surface, an appearance as of lobes. In these lobes, protuberances, or sub-divisions, there

is a change in the direction and order of the ridges; indeed, this direction is frequently opposite to that which, in general, progresses from the superior circuit of the organ to its borders. There are many subdivided surfaces of this kind on both sides around the medulla oblongata, whose borders they press. The superior rings are drawn towards a certain axis, twisted like a worm, which is called the vermicular appendix, and in which they all, as it were, knot themselves. So also on the other side where we see a similar appendix, but situate transversely to the former. There are also poles not far from the superior vermicular process. This process is noted and delineated by Eustachius [Table XVII], Fig. vii.* Meanwhile, we note that the cerebellum is a globe so knotted and a structure so intricate, that it escapes the industry of the most skillful investigator. In one place the insinuated folds and duplicatures of the pia meninx are set free and spread out; in another they so infold themselves that the joinings disappear. The insinuation, ramification, attenuation and expansion of the meninx and blood vessels, as they betake themselves into the most secret recesses, is so ineffable that the whole organ, from its surface to its inmost parts, must be esteemed as a connected and continuous structure, and one so woven, as it were, of intricate threads, that it would be an inextricable knot, unless nature, while living therein, extricated herself, as she has infolded herself, according to the connections herself has formed.

100. *Meanwhile, the position and foldings of the vermicular process, the insinuation and direction of the furrows and, moreover, the actual existence of poles in the surface, all lead to an indubitable conclusion as to the nature of the mode of the expansion and of the form of the motion; namely, that it twists itself after the manner of a perpetual circle, that is to say, spirally. On this account there are pivots, axes and poles, all of which necessarily suppose and thus indicate the existence of a spiral flux.* Such a spiral flux and torsion around a pole is shown in Eustachius's Table, referred to above. For the other points of this Induction, see the Transaction ON THE CEREBELLUM.

*This is a delineation of the inferior surface of the cerebellum, after the removal of the Pons and Medulla.

101. *Moreover the peduncle towards which the forces of the whole mass are inwardly directed, is attached to an expansile cavity, carved in the stem of the medulla oblongata.* For it is so implanted in both borders of this cavity that he who searches into the single particulars, and reflects upon them, cannot but see and acknowledge, unless he be mentally blind, that at every alternation in the animation of the cerebellum, this subjacent cleft opens and its lips are drawn apart, or, that it changes from a cleft to a ventricle or from a line to a figure. The peduncle of the cerebrum, or the base of the fornix, (of which above), is likewise girt about on every side by fissures and ventricles, whereby it receives a similar faculty for expansion and contraction.

102. *From these considerations it can be seen that the cerebellum is one grand bed of cineritious and medullary substance, which by the forces of its animation pours a copious and continuous stream of spirits into all its nerves and through these into the organs, glands and muscles,—and this constantly and in a single manner.* In this respect the cerebellum differs from the cerebrum, which latter consists of many conglomerated beds of this kind, that is to say, of many little cerebra. Whenever there is a fibre and an origin thereof, or a cortical substance, there trickles the animal juice. For the fibres are so many little canals and the cortical substances are so many laboratories and supereminent glandules which hatch out new spirit and transmit the old spirit, or that which returns from the arteries; see Transaction II, No. 165.

103. *Whence come forth natural actions and the stupendous operations of animal nature.* The common opinion still holds good, namely, that the cerebellum presides over natural, called also involuntary and spontaneous actions, and the cerebrum over voluntary, (Transaction II, n. 162). The reason of this is a consequent of the very disposition of the cortical substances, or active forces, that is, of the form which makes things to be such as we find them. (Transaction II, n. 244.) I think, therefore, that I have sufficiently set forth the nature of the ordering of the parts in the cerebrum and cerebellum, and of the form of the motion; and from this, the clear sighted

philosopher can be in no obscurity as to the nature of the effect which will come forth. I desire now to state this form more distinctly, in the following words: *For every single bud of this tree looks to its twig, the twig to its branch, and the branch to its trunk; so every particle of the cineritious substance looks to its fibre, and all together to the stem, made up of fibres, which the cerebellum, at every alternation of its expansion and constriction, leads to and fro in the yielding ventricle below.*

IV.

ON THE DETERMINATION OF THE MEDULLARY SUBSTANCE IN THE MEDULLA OBLONGATA.

103a. *In the Medulla Oblongata, the medullary substance, made up of little arterial branches, of fibres from its own cineritious substance, and especially of fibres brought from the cerebrum and cerebellum, takes its origin in the corpora striata and the thalami of the optic nerves, which are called the superior beginnings of the medulla oblongata. But it is soon dilated into a kind of ring-shaped protuberance and also into two other protuberances, called the pyramidal and olivary, situate below; from this point it is then contracted into a somewhat narrow stem at the great foramen of the occiput. On the posterior side, it is split into a long cleft, which constitutes the fourth ventricle. From this common appendix of both brains, the associated fibres, joined together into beginnings, into tender little bundles, and finally into sensory and motor nerves, hasten forth through the foramina carved in the cranium, to the work of constructing the organic machine of the body. The protuberant bodies of this medulla expand and contract according to the direction of the fluent fibres, or according to their acquired form; and they do this both breadthwise and lengthwise, and also in unity with the brains, both in general and in particular.*

The spaces between the meninges, the lateral ventricles and

also the fourth ventricle, the sanguineous receptacles within, the intercalated clefts and retiform plexuses, all give abundant means for this expansion. But the specific directions are as many as are the beginnings of the nerves that issue forth, and to which as to peduncles the expansory motion is determined. But in general they tend toward the medulla spinalis; in order, however, that they may suitably refer themselves to this point, they finally curve around from the anterior portion of the medulla oblongata to its posterior, towards the fourth ventricle, and thus to the posterior portion of the medulla spinalis.

104. In the medulla oblongata the medullary substance, made up of little arterial branches, of fibres from its own cineritious substance, and especially of fibres brought from the cerebrum and cerebellum, takes its origin in the corpora striata and the thalami of the optic nerves which are called the superior beginnings of the medulla oblongata. There are some who suppose that these superior striate bodies* are to be reckoned among the members of the cerebrum because they constitute the floor of the lateral ventricles, and because the middle fissure or third ventricle, together with the infundibulum, is extended entirely between the crura or thalami,† that is to say, where their heads come together. But since it is not a matter of much importance to determine what parts are to be assigned to the cerebrum and what to the medulla oblongata, I merely mention the matter and leave it to the decision of the reader. For the medulla oblongata itself is, for the most part, a coagmentation of concurrent and coalescing fibres from the cerebrum and cerebellum, and in this respect it might well be called the appendix of both brains. But the striate bodies above, rise from their own origins or cortical substances, and in these are mingled fibres of the cerebrum only, but not of the cerebellum; hence the part constituted by these bodies should

**Corpora striata.* The term here includes both the corpora striata proper and the optic thalami. The latter were sometimes called the superior posterior corpora striata, for, like the cor-

pore striata proper, they are streaked with white and gray matter.

†The optic thalami were sometimes called the crura of the medulla oblongata.

properly be designated as the medulla oblongata of the cerebrum. For the fibres of the cerebellum do not meet the fibres of the cerebrum, except in the annular protuberance and just above the fourth ventricle, where this medulla begins to be the appendix of both organs.

105. *But it is soon dilated into a kind of ring-shaped protuberance* and also into two other protuberances called the pyramidal and olivary, situate below; from this point it is then contracted into a somewhat narrow stem at the great foramen of the occiput. On the posterior side, it is split into a long cleft, the fourth ventricle. From this common appendix of both brains, the associated fibres, joined together into beginnings, into tender little bundles, and finally into sensory and motor nerves, hasten forth, through the foramina carved in the cranium, to the work of constructing the organic machine of the body. I pass by any further description of these matters, because they do not readily come to the apprehension of the understanding without some idea acquired from plates. The reader should, therefore, consult [anatomical] treatises.*

106. *The protuberant bodies of this medulla expand and contract according to the direction of the fluent fibres, or according to their acquired form; and they do this both breadthwise and lengthwise, and also in unity with the brains, both in general and in particular. We cannot indeed behold the motion of this organ, for it lies underneath the brains and is guarded and defended by the strong basilar bone,† but still the rational sight or the mind, which penetrates to secret recesses of nature denied to the eye, judges from the indications afforded by the forms and by all that comes to view, that the single bodies of this medulla beat in systole and diastole, equally as do the brains. For here we see incisions in the form of clefts, gaping spaces, fibres continued from the brains, appendices on which are impressed motions, throbbing arteries*

*The annular protuberance or pons Varolii.

†A name given to the sphenoid bone.

placed in the midst, interstices between the beginnings of the nerves, and a perpetual flow of animal spirits and humors. Therefore he who denies motion to these scales and levers of the brain, he also denies life to the body; for we live as animate beings by virtue of motion, and we move by virtue of life.

107. *The spaces between the meninges, the lateral ventricles and also the fourth ventricle, the sanguineous receptacles within, the intercalated clefts and retiform plexuses, all give abundant means for this expansion.* As regards merely the sanguineous receptacles; these present themselves to sight scattered here and there in the cerebrum and cerebellum, and also in the medulla oblongata, where, however, they are less dense. For they are, as it were, sinuses or asylums for the superfluous and worn out blood, and are so numerous that, in divided hemispheres, they present the appearance of ruddy stars. Their use is not only that they may receive any excess of blood, and may help in dilating the brains, but also and more especially that they may hold the brains to a just measure of expansion. For it is known that the brains swell in gladness, courage, and hope, but are contracted in sadness and fear; and yet in every such state induced by the affections of the animus they continue their animatory alternations. Hence the effects that follow are either stronger or weaker; hence also the cerebrum is stretched, as in wakefulness, and its beds relaxed, as in sleep.

108. *But the specific directions are as many as are the beginnings of the nerves that issue forth, and to which as to peduncles the expansory motion is determined.* For the directions of the motion are particular, specific and general, all so co-ordinated and subordinated that the particular directions refer themselves to their specific directions, the specific to their generic and these to one universal direction. The most single determinations are as many as are the fibres; the special determinations, as many as the bundles of fibres; and the general determinations, as many as the nerves. Such is the case in the annular, olivary and pyramidal protuberances; such in the striate bodies; and such also in the cerebrum and cerebellum; but all return to the common direction,—the direction of the whole encephalon,—to which all inferior directions are subsidiary and with which they conform.

109. *But in general they tend toward the medulla spinalis; in order, however, that they may suitably refer themselves to this point, they finally curve around from the anterior portion of the medulla oblongata to its posterior, towards the fourth ventricle, and thus to the posterior portion of the medulla spinalis.* This is evident from the direction of the fibres; from the transverse and perpendicular incisions which transverse the medulla oblongata in the neighborhood of the pyramidal and olivary eminences; from the manner in which the fourth ventricle and the calamus scriptorius are expanded; from the influx of the motion of the cerebellum through the peduncle; from the break in the medullary and spinal stem posteriorly, but not anteriorly, in the great foramen of the occiput and the vertebral cavity; moreover also from the exit of the nerves and, in the whole cylinder, the direction of their motions toward their beginnings; besides many other indications of which we shall speak in detail in our transactions.

(*To be continued.*)

THE SENSES.

TRANSLATED BY E. S. PRICE, M. A.

CHAPTER VII. (*Continued.*)

447. 4. 1. The senses differ from one another in degree; the most composite is touch, the simplest of the external senses is sight. 2. Wherefore, they differ in the perfection of all qualities; 3. altogether according to the objects which touch, impel, strike and affect. 4. According to those degrees the organic forms of every sensory are compounded and arranged. 5. According to those degrees the fibres themselves, from which arise the organic forms, are compounded. 6. According to those degrees the modifications run through their own fibres. 7. According to those degrees they undergo changes in the common sensory or the brain. 8. According to those degrees arise the affections of the brain. 9. This is the cause of the diversity of the five senses.

448. 5. 1. Every sense of every degree has its maximum and minimum; the minimum refers to its maximum, as unity to its number. 2. The organic forms themselves determine this in every external sense. 3. Furthermore every sense must also have its general, to which the modes or unities will refer as parts. 4. Generals differ from one another, as the series of parts or modes; 5. thence the parts or unities exist rightly distinguished from one another, and come forth to evident perception.

449. 6. 1. All ideas arise from sensations; 2. and are therefore changes of state in the brain and its cortical substances. 3. Generals are changes of state among the cortical substances, which changes must correspond with singular changes. 4. Wherefore all ideas, because they are changes of state, are affections, or there is in them what affects, furthermore there is also between them, or in their nexus, what affects. 5. The more perfect or simpler senses, as, for instance, sight, enter

more intimately into the brain and its substances, or change the interior fabric, and thus affect more perfectly. 6. Wherefore the whole doctrine of sensations, both exterior and interior, depends upon a knowledge of the structure of the organs in the sensories, in the brain and in its cortical substances. 7. Wherefore the doctrine of sensations and of the ideas consequent thence, depends upon a knowledge of the changes of state in those structures; it depends upon the doctrines, namely, of order, of degrees, of forms, of influxes, of correspondences, of modifications, which are to be treated of in a special work. 8. Every general contains endless parts under it, which exceed all geometrical, physical and philosophical science.

450. 1. *The origin of all sensation is external touch or impulse.* 1. This has been confirmed especially in respect to the single sensations. 2. That touch itself is impulse is not doubtful, because it is touch. 3. That taste is impulse, see also above; for there are parts dissolved in the saliva and in other menstrua, which thus strike the papillæ of the tongue. 4. Smell arises from the touch of the parts flying in the atmosphere, especially in the aerial. 5. Hearing appears to be from a modification of the air, of which above, from an impulse upon the membrana tympani, from the blows of the stapes, even from the malleus upon the fenestra ovalis, from the sensible percussion, and the tremor of the bodies thence arising, from a great sound, as in bombs, in crashing, in thunder. From the origin of sound from the tremiscence of harder bodies, and its correspondence in the consonant nerves, and from many other things. 6. Sight likewise from concentrated rays, as in burning mirrors, which exert such a force that it melts the parts. A ray of sunlight in the nasal cavities even excites the fibres into a convulsive motion or into sneezing. From the origin of light, similar with the origin of sound, its tendency to a straight line, from reflection and from many other phenomena. From effects one must conclude concerning those impulses which do not fall visibly under the sphere of the senses; for without activity and change thence arising nothing sensible can exist. 7. Thus all external sensation

arises from external causes, or causes in the macrocosm which act upon the microcosm, in order that the soul may be made conscious of all contingencies outside its own little world, and may be thus affected: then in order that it may learn and know how to live in respect to the whole universe, and thus may be informed for agreement of its forces, and for correspondence, as a state is formed, so it may always be conserved and may recognize what is true and what is false, what is good and what is evil.

451. 2. *Touch or impulse is into the fibres or tunics of the fibres, thus it is external.* 1. The fibre is a kind of very small vessel, which carries what is called the purer blood or animal spirit as the blood vessels carry the blood. 2. Thus according to the same rules the tunics together with this fluid actuate one cause, the fluid, the principal cause, but the fibre, the instrumental cause; the one is altogether accommodated to the other. 3. Sensation, or its touch or impulse acts upon the tunic of the fibre, wherefore extrinsically. 4. Indeed every sensation, even an internal one, [arises from touch or impulse], for it is a change of the state of the tissue composed of fibres, whence affection arises. 5. Thence in sensations an external cause is active; 6. but it cannot act, still less be modified, unless the internal or principal cause concurs; but there is one action originally into the tunic of the fibre, there is another into the fluid itself within the tunic. 7. Every sensation acts upon the tunic, thus externally; 8. but indeed every action, from the will and its determination acts upon the fluid itself, thus internally; 9. thence the motor fibres are excited. 10. How this external change is produced by external [action], and of what quality is the circle from the understanding and its ideas to the determinations of the will, must be treated of in our Psychology. 11. Therefore, the external world produces sensations, but the internal, actions: the internal also produces internal sensations, but originally arising from the external world; but they are for the benefit of the internal forces, which then concur.

452. 3. *Wherefore the fibres must be so organically formed and arranged, that they can receive the differences of every touch of that kind distinctly.* 1. What the quality of the little

organs or organic forms of every external sensory is, has been treated of in their particular disquisitions; see and confer in respect to touch, taste, smell, etc. 2. The little organs, that is, to say, the papillæ, etc., in themselves, and among themselves, 3. are formed entirely after the nature of tactile, impelling or modifying objects. 4. Wherefore the sensories are organs formed entirely after the nature of objects and of modifications; thus in order that we may be instructed from them, as to how nature acts extrinsically, and in order that we may be instructed from modifications, as to how the little organs should be formed, 5. whence the acoustic, optic, and many organs derive their origins; 6. but the most perfect of all are those in microscopic animals; in these there is absolutely nothing, which is in nature, with its single varieties, even to infinite and all possible varieties which is not impressed therein; 7. it is required that those forms be correspondent, both in themselves, and to one another; for one is the particular, the other general, it is required that the correspondence belong to each, in order that the particular may be distinct; 8. indeed every particular, such as a papilla, is a kind of general, which has respect to the single things in the papilla, in order that the particular form may be distinct, 9. and so forth; 10. also every most general state of all, or the tissue of the whole organ must correspond.

453. 4. *The sensations of touch, taste and smell arise from a touch or impulse of things heavy or of the forces of inertia, that is, of particulars.* 1. This has been shown in single treatises. 2. As that these sensations arise from saline, sulphurous and other volatile bodies which are figured, of an angular form furnished with diverse angles, planes, protuberances and cavities; 3. thus from the external figures of the things themselves which prick, soothe and variously affect. 4. That the objects of taste are rolled about in water and dissolved by the salivary fluid and other menstrua, is known; 5. that the objects of smell float in the atmosphere, see above. 6. All the parts of an angular form are angular in their smallest parts and variously pointed; so that their elements are of such a character, having by contrary determination lost all active and elastic force. 7. Thence arise similar compounds; 8. but of these things else-

where. 9. The external figure can be of every kind, even circular, but still its internal determinations make it to be referred to that class, not, however, its external form. 10. The essential determinations themselves, from which forms are produced, make them to be of this or that form; 11. these are principally called parts, yea, the very elements of them, deeply within which are such determinations. 12. These parts can be divided even to their parts or elements, but if further, then the determination is destroyed, thence they fly off into the forms of that order, from which they were originally determined. 13. From this it appears how a division of those forms can be made. 14. Their elements are from the elements of many forms the most perfect of which are from the purer ether, then from the common ether, even from the air itself; the last have less of gravity; they can be dissolved even to the parts of the air. 15. But of these things elsewhere. *These things will be treated of in notes, not in the text.*

454. 5. *But hearing and sight are from a touch and impulse not of things heavy, but rather of active forces.* 1. Hearing is from a modification of the aerial atmosphere. 2. Sight is from a modification of the ethereal atmosphere. 3. There is some gravity in the air, wherefore the sensory of the ear is composed of membranes, tremiscible and cartilaginous, and these membranes are composed of little nerves. 4. Thus they respond as well to the elasticity of the air as to its gravity; they have forces of inertia and forces of the active, or something distinctly in the ear. 5. The forces absolutely active or elastic respond altogether to the forces of gravity, for the latter arise from the former, for all gravity is from the active forces which determine it; 6. rather from the tendency of the ether to the center of gravity; the ether enters every part of the angular form, yea of the circular form; so also every part of the superior form, such as are all the parts of the inferior form. 7. Thence gravity increases according to degrees, and it arises from those things which are less heavy, or from pure active forces. Thus there is a kind of superior gravity in the ether itself. 8. The beginning of gravity is in celestial forms themselves. 9. But concerning these things elsewhere; they will be

treated of in *the notes*, not in *the text*, except briefly. 10. That touch and impulse are to be derived therefrom, see above, No. [444] 1.

455. 6. *In order that evident and affecting sensation may exist, there must be many differences in one touch, thus a form of the differences.* 1. In taste there must be parts variously figured which touch; 2. similarly in smell. 3. So that there are infinite touching points of diverse angles, planes, cavities, protuberances and spheres. 4. Without form no quality is predicable. 5. Unless there be forms in unities, a suitable form will not arise from a number of parts. 6. How infinite the things must be which constitute one touch, see above; as are the unities such is the common affection of the many things which refer to their own unities. 7. How many varieties, a single and simplest sound of our ear produces, see above, also Part II. of the *ECONOMY OF THE ANIMAL KINGDOM*; 8. to the extent that infinite things can be said to be in every unity. 9. The more compounded a form is the fewer are the things which are in it; thus there are even more things in a single visual ray than in the whole of sight. 10. In its smallest parts nature sports according to all its nature, and most distinctly; not so in compounds, where there are scarcely any things except disharmonies. 11. Unless these disharmonies be restored into their harmonies, by the harmonies which are in unities, the machine would not subsist even for a moment. 12. But unities appear to us for the most part without form; for what of form can be noticed in a unity? Thence arise the fallacies of the senses. 13. Nevertheless they are very distinctly perceived through affections, grateful and ungrateful, by the soul, which is within the compounds themselves as a common, and, as it were, ungrateful affection.

456. 7. *The differences of this form must be simultaneous or successive.* 1. There is nothing simultaneous which must not arise from successives in nature; it is an attribute of nature that it shall successively proceed to things simultaneous. 2. It is otherwise in supreme things where what is, is together, nor is there anything simultaneous; this *being together* produces the simultaneous in nature, when for the sake of effects

it produces ends by natural causes. 3. Simultaneous things are in natural things, even in angular forms, for by successive determinations they are so formed. 4. Simultaneous things appear to be of this touch, especially in unities, although they may also be successive; for one moment of our sensation may be composed of infinite, purer moments which we do not apperceive; thence is space and time. 5. Successive differences exist between the unities, or in the number of many things, even appreciable differences, as in hearing and sight. 6. But these successive things must be formed into simultaneous things in a superior sphere in order that they may be apperceived in the perception, and especially in the representation of the soul, as harmonic or disharmonic. 7. These analogies are natural, and they agree with the state of the superior organs and of the brain, which organ and brain apperceive them. 8. But to describe those harmonies and disharmonies is an immense field; for one must run through the whole nature of the universe, and, at the same time, of the microcosm, and make application to the tissue of the microcosm. 9. In a word, differences are never apperceived without form.

457. 8. *Form arising from successive things puts on the same quality as that arising from simultaneous things.* 1. This appears from musical harmonies, 2 from optics, palaces, ornaments, if they are orderly and coherent. 3. Long is the way to gather the quality of forms from successives, as from sounds 4. But they are reduced to simultaneous things, 5. especially in the soul, which is proximately in simultaneous things, because it is a spiritual essence. 6. There must be a ratio of one to the other, mutual respect, analogy, which is not perceived unless the consequent is respected in the antecedent, and the one is compared with the other; thus the presence of all is required that a judgment may be made. 7. If anything is wanting in the antecedents or perishes therein the connection perishes, and all relation which will indicate the quality. 8. Thence it follows, that there ought to be a perpetual variety, so that from varieties suitably conjoined, the relation may be either affected or judged of.

458. 9. *Organico-sensory forms are formed for receiving*

the forms of such differences distinctly. 1. The cuticle is so formed, the tongue, the nostrils, the ear, the eye, 2. with their papillæ and the connection of the papillæ with one another, 3. with the whole tissue. 4. You may see these things distinctly expounded above. . . .

459. 10. *The organic forms of every sensory apply these varieties of differences, as well the simultaneous as the successive, entirely to themselves.* 1. You may see these things also in the exposition of the single senses. 2. Wherefore we will pass by this discussion . . . for it is a consequence of what has been said.

460. 11. *The organic forms communicate those varieties with the fibres of which they are composed.* 1. For they are formed from and spring forth from the fibres; 2. they are the organic extremities of the fibres; 3. for the end that they may receive varieties distinctly, and may carry the received varieties distinctly to the brain. 4. There are fibres which themselves contain conducting fibres and little channels, which carry away. 5. They are determinations from the organs to the brain, and from the brain to the organs. 6. Wherefore the brain feels according to the state of the organs, as also according to the state of the fibres, for these are what shall announce the touch and impulse. 7. Therefore the organs of the external sensory, the fibres going between, and the receiving organs of the fibres must correspond exactly to one another. 8. If they be discrepant, a complete discrepancy results in the common sensory. 9. This appears from the effects in the organs or the fibres or in the brains, from particular diseases and sicknesses. 10. *Wherefore the organic forms of the sensory communicate those varieties with the fibres of which they are composed.* 11. This is the consequence, that there may be no point in a papilla, which does not have respect to its own fibril; 12, so that whatever happens in one extremity must be represented in the other.

461. 13. *These fibres, by a kind of modification or transference after the analogy of chords, carry away the received varieties according to antecedents towards their beginnings or to the cortical substances.* 1. This will appear from the

very wonderful nature of modification and tremiscence; 2. for modification is said to be the atmospheres and contremiscence in things continuous; 3. these things respond to each other. 4. From the smallest origin the whole volume is modified from extremity to extremity, and the whole mass trembles, indeed from the smallest touch, as that of a needle, a whole table trembles, whence arises a sound; still more perfectly and infinitely in the ether from the smallest reflection; 5. in purer things always more perfectly even so that every extent trembles; and thus exceeds belief. 6. From a single very small string, the belly of a whole great instrument, and all contiguous things, especially the whole volume of the atmosphere even to every distance, trembles. 7. Thus also the nerve fibres go forth; that they are formed entirely for receiving and transferring modification will be demonstrated in their own place. 8. Every one of them receives its own modulus and carries it away; many together receive the mode of the whole or the general mode and so forth. 9. Even the fluid in the fibres, which emulate the aura, conspires with the nature of what is to be modified. 10. Because the fibres are determinations, every modification runs through that containant, even to our sense, in an instant. 11. It runs into antecedents or from simples to compounds; for the beginning of modifications is in smallest things, where it is expanded, 12. and where there is nothing but what is elastic, in which no force perishes. 13. Every sensation or sensory modification tends to antecedents, or towards the beginnings of the fibres. 14. For every determination into act tends from the beginnings of the fibres to consequents or to the motor fibres. 15. Thus the determinations of sensation and of the will are contrary to each other; 16, but still they concur in the beginnings; for where there is understanding there is will; the latter flows from the former. 17. Such a contrariety of determinations arises, partly from the causes of sensations which act upon the tunics of the fibre, and thus act by a modification of what is continuous, the continuous or enclosed animal spirit assisting, and giving wings [to the sensations]; partly from the sensory fibres themselves which flow into the same mode; it is otherwise with the motor fibres,

of which elsewhere. 18. It is evident from anatomy that the cortical substances are the first substance of the ultimate and of the first of the fibres. 19. Wherefore modification cannot subsist except in ultimates and in firsts, that is, in the cortical substances, which thus represent the common sensory. 20. To place the common sensory in the fibres themselves is to place it in mediates, not in ultimates, for the fibre has nothing which it does not derive from its own beginning or from the cortex. 21. The cortical substance represents the brain in the smallest effigy, wherefore it is a sensory; and it represents the heart in least effigy, wherefore it is the common motory. 22. Here are to be sought the arcana of psychology. 23. These, nevertheless, cannot be explored except from the brain, for the brain and the single cortical substance refer to each other, and mutually represent each other, as the prior and posterior.

462. 14. *And that indeed most perfectly by the aid of the spiritual essence which is within.* 1. This substance emulates the auras in modifications and in active forces. 2. They are so highly elastic that nothing perishes. 3. The fibre dry or deprived of spirit is incapable of modification except a confused one; 4. wherefore the sensory fibre itself is soft, and is composed quite differently.

463. 15. *And indeed according to the nature of the modification and tremiscence, into every contiguous fibre, thus into the whole cortical substance both of the cerebrum and the cerebellum, and also of the medulla oblongata and the medulla spinalis.* 1. Differently from the motor force, which is determined by distinct fibres into the muscular fibres. 2. This is the nature of all modifications in order that they may enter into contiguous parts. 3. Such is the connection of the fibres especially in the medulla of the brain, that all are pervaded. 4. For there is fascicle within fascicle,—perpetual anastomoses and crossings; 5. thus to every single cortical substance. 6. But it is not received in a similar manner by the single substances, because there is a variety of all of them. 7. It is received according to their state in particular, if they are more expanded in one way, if more contracted, in another. 8. The general state is also received by them.

(To be continued.)

THE NEW PHILOSOPHY.

VOL. XIII.

APRIL, 1910.

No. 2

Editorial Notes

THE ANNUAL MEETING.

We call the attention of our readers to the notice appearing on our cover page, announcing the thirteenth annual meeting of the SWEDENBORG SCIENTIFIC ASSOCIATION to be held in Philadelphia on May 16. This date, it will be observed, comes just before the meeting of the General Convention in New York. It is hoped that this will enable many to attend, who, on account of distance have been kept from former meetings of the Association.

THE FIBRE AND THE SENSES.

We also call attention to the advertisement of the sale of two parts of THE FIBRE (pp. 1-32), and six parts of THE SENSES (pp. 1-96). When completed the former will comprise about twenty-three parts, and the latter eighteen. Both works will eventually appear in book form, but since, at the present rate of progress, this will not be for a considerable time, therefore, for the convenience of those who wish to study or consult the works, single parts will be put on sale as they are printed. The price will be five cents each, post paid.

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THE SENSES.

TRANSLATED BY E. S. PRICE, M. A.

CHAPTER VII. (*Continued.*)

464. 16. *From the living essence, which is within the spirit and the fibres, modification becomes sensation, change of state produces affection according to the form of the modifications, and so forth.* 1. Of these things see Parts I. and II. of the ANIMAL KINGDOM. 2. Every fibre is traversed by the animal spirit, in which as a beginning is the most universal essence of the animate body, which essence is said to be the soul. 3. The most simple fibres themselves consist of this essence. 4. The soul itself, which alone lives in the body, gives to perceive the qualities of modifications, 5. especially in the cortical substances, where the soul resides organically. 6. There the soul sensates every change thence arising. 7. It is the very sensation of changes by the soul, which causes a dead modification to be called living, or sensation. 8. Aside from this there is no difference.

465. 17. *According to affections arise changes of state in the organs.* 1. In respect to this see what is said in respect to every article or organ of sense. 2. The affections are what determine the will into actions, the cerebrum into voluntary, the cerebellum into involuntary actions. 3. As is the affection of the brain, such becomes the affection of every fibre; for the animus of the brain, because it flows into the animal spirit, flows forth into the fibres, and reigns everywhere, 4, especially in the motor fibres of the muscles of the organ, which are initiated for putting on similar changes of state from nature, connection and use. 5. Likewise therein the affections of the pure sensory are communicated with the motor fibres of the same organ: see the articles concerning the single sensories.

466. 18. *This modification of the fibres, in the beginnings themselves or in the cortical substances, is spread abroad according to every form of the modifications; for those beginnings are formed according to all that nature.* 1. The cortical

forms, which are the beginnings, cannot be explored except by an examination of the brain, for they are brains in the smallest effigy, with a difference of perfections such as there is between entities, prior and posterior, between the more simple and the compound, which the doctrine of forms will teach, as also the doctrine of order and degrees. 2. Modification cannot arrive at those termini except it be spread abroad according to their form; 3. for it runs forth into every one of its more simple fibrils. 4. For the fibrils are furnished with a surface and most tender meninx, they are in the fibres, they are in the still more simple substances emulous of the cortical substances, 5. but arranged according to the form of a purer nature. 6. They are receptive of all changes of state; in which receptibility their perfection consists, so that it may be infinite. 7. In these the soul resides as in its very own organic beginnings. 8. Wherefore every modification flowing thither is spread abroad and induces changes of state. 9. That they are formed for the form of the modifications, see Part II. of the *ECONOMY OF THE ANIMAL KINGDOM*. 10. Thus that form cannot be explored except from the doctrine of forms compared with the form of the parts of the ether, or of its modifications in what is greater, of which above.

467. 19. *Thus as many as are the differences and as many as are the varieties in a touch, and among touches, so many diverse changes of state do they undergo, for their perfection consists in this.* 1. There are modifications which run thither through the single fibres; they are so many causes of changes [of state]. 2. For there they are concentrated and distinguished. 3. That there are general and particular changes of both in the substance itself and among the substances themselves. in the bundle, in the congeries, in the whole brain, is to be learned elsewhere.

468. 20. *From the form of the differences, of the modifications, and of the changes of state thence arising, arise affections, namely, grateful ones if they agree with their natural state, ungrateful if they disagree.* 1. That is grateful which agrees with the state of one's soul; 2. for according to this state is formed the state of these substances, and finally of the brain itself; 3. especially do they accede to the nature of the

universe. 4. Changes of state which do not agree are those which attempt to pervert that established state; they twist, and do injury and harm to those [substances]. 4. Those affections which agree are grateful in infinite ways. 5. These things are to be drawn from the doctrine of forms.

469. 21. *Hence every touch or mode, which is represented as a unity in the sense, whether they undergo successive or simultaneous varieties, is either grateful or ungrateful.* 1. Our rational mind does not sense this variety, which does not accede to the principles of those harmonies, for it is an inferior faculty; 2. but the soul, which perceives the smallest things in itself and in its organ which is formed to the nature of the soul's representations, does perceive them; 3. for the soul itself is in the order, rule and truth of the universe, hence of itself it sensates what is consonant or what is dissonant; 4. that is, it is born with it, for its organs are born and formed for it. 5. It sensates therefore what destroys and what conjoins, or, more deeply, what is true and what is false, and what is good and what is evil. 6. All the unities of the senses go more deeply than to the consciousness of our mind; 7. for the single rays, an infinite number of which constitute one sensible [impulse], touch some one of the more simple fibres; the harmony is what affects, and thus produces an affection, or love and hate, desire or aversion, and so forth.

470. 22. *It is similar with the unities or modes among themselves.* 1. Those things which come into the perception are either unities or simple sensations; 2. their harmony among themselves produces a common affection; 3. for they change the very nexus between the cortical substances, 4. nay, more, the whole brain; 5. and, because the order of all things, as well that of simples as that of compounds coincide, general affections arise from like causes. 6. General affections, or those of the whole brain, have respect not only to the connections of the cortical substances but also to those of the fibres. 7. A like change of state is noticed among the fibres as among the cortical substances; 8. for the whole system is what suffers change. 9. But the soul does not sensate those

Thus it sensates affections even in the external sensory itself, and simulates them; as though it were there alone; such a presence is simulated.

471. 23. *The senses differ from one another in degree; the most compound is touch, the simplest among the external senses is sight.* 1. The doctrine of order and degrees teaches what degree is. 2. For there are also degrees of composition; one does not come from one degree to another except by compositions. 3. When a composition is resolved into its unities a degree then perishes; and in the unity itself the superior degree succeeds; 4. thus in the unities of unities, and so forth. 5. The whole universe and animal kingdom is composed according to such degrees and in such order. 6. That taste is a superior degree of touch, is evident from the objects which strike the papillæ, which are compound; it is also evident from the papillæ themselves. 7. That smell is a degree of touch superior to that of taste, is also apparent from the particles which strike and from the papillæ themselves. 8. That sight is a degree higher than hearing is likewise evident from the organ and from the atmospheres themselves; for they are formed with regard to the modification of their own atmosphere. 9. Unless we admit that there are degrees of the atmospheres, we can admit degrees neither of organs, nor of sensations. 10. Wherefore we cannot do this unless we admit the divisions of the parts of one atmosphere into its principles. 11. See above concerning these things.

472. 24. *Wherefore they differ in the perfection of all qualities.* 1. Superior forms are the measures and beginnings of inferior ones. 2. They are to be conceived as a form of unities respectively to the inferior forms, which are referred to the forms of a number of such unities. 3. To our sense, respectively to inferior forms, they are almost infinite; nor are their differences recognized except by a superior sense. 4. Respectively to our senses all successions are represented together in those forms, or as simultaneities. 5. There are infinite forms of celerity respectively to inferior forms, for myriads of celerities scarcely compose a one which may appear as a simultaneous in an inferior sense. 6. They can put

on infinite changes of state in the smallest moment of an inferior sense. 7. They are more perfect in respect to form, essence, nature, attributes, accidents, and therefore in respect to modes. 8. They are in their own form, and are more constant than are other things which depend upon them. 9. They are more fluid. 10. They are more powerful than any force, as for instance the elastic force. 11. They are more beautiful and suitable. 12. They are more distinct, more unanimous, more similar to one another, more harmonic. 13. They are more unlimited and freer. 14. They are more sensitive, more rational. 15. They remain longer, for they cannot be hurt by inferior things; for prior forms exist without posterior forms, not the reverse. 16. They are as it were without time and space. 17. Terms which can be applied to inferior forms cannot be applied to them except by analogy and eminence; for they pass beyond the sphere of words, when they pass into a superior degree. 18. Thus sight is in a higher degree than hearing, understanding in a higher degree than sight, the representation of the soul in a higher degree than rational sight. 19. Superior forms are prior, interior, more remote, simpler. 20. They are also more universal. 21. These things will be seen in the doctrine of forms, and of order and degrees.

473. 25. [*They differ*] *altogether according to the objects which touch, impel, strike, and affect them.* 1. Touch requires objects very much compounded. 2. Taste requires the parts of those parts which float in water. 3. Smell requires the parts of those parts which fly in the atmosphere. 4. Hearing requires the modifications of the aerial atmosphere; how crass these modifications are is apparent from sounds, from musical instruments, and from many things, for one must speak long that one visual idea may be produced; we can at once measure with the eye things which can scarcely be given in books and speech. 5. Thus one sensation is superior to another, wherefore more perfect than another.

474. 26. *The organic forms of every sensory are arranged according to those degrees.* 1. Thus things are more perfect and more imperfect, 2. in every quality, according to the above

recital of perfections. 3. They must be varied according to the superiority of qualities.

475. 27. *According to those degrees the fibres themselves, from which organic forms arise, are compounded.* 1. Such seems to be the manner of the composition, of which we have treated in the Part concerning the medullary fibre of the brain and the nervous fibre of the body.* 2. The first of all are the simple or simplest fibre; which determine the rest, and they are determinations of the soul itself; 3. from these the fibres of our inmost sense are determined, this is a second composition; 4. from these again are determined the visual fibres or those emulous of the visual fibres; this is a third composition; 5. from these again there is a fourth composition, which is that of the fibres of hearing. 6. But let us tarry in the fibres of sight, which are of the third composition; these are its unities. 7. Many fibres taken together, and bound with a common membrane, are fibres which belong to every papilla or organic substance of the retina of the eye. 8. These correspond to the general of the parts. 9. These again coalesce in the nerve which is called the optic nerve. 10. Thus common visual fibres correspond to every single cortical substance, or each papilla to every single substance. 11. Thus there are three unities: one of these is the simple unity of the visual fibre or third composition, the second is composed of the latter, and the third is the optic nerve itself. 12. Each one of these if resolved falls back into the simpler sphere. 13. But the acoustic fibres or those of the ear are of the fourth composition and are its unities. 14. These unities are scattered through the membranes of the cochlea and of the canals. 15. But the unities of the fibres are diverse, and yet they correspond to each other, as do the papillæ. 16. But indeed the fibres of smell, taste and touch seem to be of a similar composition, in regard to the smallest matter of taste and touch. 17. But the papillæ themselves are consociated and inclosed in a sheath or covered with an epidermis, so that thence the touch of many things may give a rather dull sense, as has been observed.

*This manifestly refers to the work on the Fibre. See n. 475. 20.

18. But the motor fibres are little formed canals through which flows the animal spirit. 19. Therefore the sensory fibres are softer than the motor fibres; this happens from their composition. 20. But you will see experience agreeing with these things, in the Part on the Fibre.

476. 28. *According to those degrees the modifications run through their own fibres.* 1. The modifications run through more perfectly as the fibres are of superior or simpler composition; 2. thus visual modifications, more perfectly than the auditory; 3. thus they run through the second or inmost fibres still more perfectly, where they can scarcely be called modifications. 4. They run through the simple fibre most perfectly. 5. All perfection decreases according to the degree of the composition. 6. The rays or modes of that most simple organ, or the unities of the modifications fly most perfectly; for they are formed and rolled quite agreeably to the nature of that modification; 7. then their common modes, or those of every papillæ; 8. then their most common modes, or those of the whole nerve; 9. these modes, that is to say the particular, the common and the most common, must agree, in order that any sensation may exist. 10. The one reduces the other into order with itself. 11. Hence the least discrepancy is instantly corrected by the inmost modes, through composition and harmonizing. 12. All their parts conspire to their general for their general is of the parts.

477. 29. *According to those same degrees also changes take place in the common sensory or the brain.* 1. The brain is in a manner similar to the fibres. 2. There are cortical substances; 3. there are clusters of the cortical substances; 4. there are balls of these clusters; 5. there are congeries of these balls, and serpentine crowds; 6. of these latter are the whole brains or hemispheres. 7. The one is arranged quite agreeably to the other, in the highest natural order, 8. and in similar harmony and form, 9. with a difference of perfection. 9a. Wherefore the particular, general and most general modes, agree, and each one produces its own harmony or disharmony; 10. thence the changes occur in like degree.

478. 30. *According to the same degrees occur also the af-*

fections in the brain, 1. that is to say, according to the changes, 2. and their harmonies or disharmonies. 3. Therefore this is the cause of the diversity of the five senses.

479. 32. *The organic forms in every organ determine these things.* 1. We have treated of their varieties in the Part on the Tongue. 2. They determine these things also in hearing, where the nervous fibres consisting of the composition of many fibres enter the sonorous membranes, 3. according to every perceptible variety, 4. similarly the papillæ everywhere.

480. 33. *Every sense also must have its own general, to which the modes or unities are referred as parts.* 1. The general is not the greatest of that sense; 2. but is in a superior degree. 3. As one papilla or one fascicle of fibres is a common unit, 4. also all the papilla, or the whole nerve is the most general.

481. 34. *The generals differ from one another, as do the series of parts or of modes.* 1. The general is what results from the parts. 2. From a few parts results a general different from that which results from many. 3. One papilla is the general of its own parts, unities or fibres. 4. Many papillæ produce a most general; 5. wherefore a general finds place according to the number of unities; 6. for generals have their unities as do the parts. 7. Parts, generals, and most generals correspond to each other as degrees. 8. The parts are the supremes of that sense, the generals are the inferiors, and so forth. 9. Thus every sense has its own degrees; 10. likewise also the fibres; 11. consequently like as modifications and interchanges. 12. Generals have also their greatest and least. 13. I have treated of the idea of generals in the passage on the peritoneum; as is the idea of generals in substances, such also it is in accidents and modes. 14. The concordance of parts and of generals effect that all things may be rightly accomplished. 15. The smallest discrepancy from the parts, in which there is a more perfect nature, is reduced into order.

482. 35. *Thence the parts or unities exist rightly distinguished from one another, and come forth to evident perfection.* 1. Generals are what come to the perception. 2.

They give the sensation itself, 3. under which the parts are perceived; 4. otherwise they would not be distinguished except by their general which gives perception. 5. As in substances, so in modes. 6. Thus colors without a shaded plane and their own general are not perceived. 7. Sounds without the tremor of the whole cranium and brain and meninges are not perceived. 8. Smell without a modification of the pituitary membrane is not perceived. 9. As in the strings of a musical instrument, when a string is touched, there is a tremulation from end to end; these tremors have reference to its parts, for they flash through the smallest of its parts; thence a string is vibrated to sight itself through a second vibration and certain form of gyration, which is its general tremor: as does the string trembles, so also does the whole body of the instrument; this is its most general. 10. A string cannot tremble particularly unless it trembles generally, nor generally, unless most generally. 11. From the harmony of these things arises sound or the particular distinction of sound. 12. But the prior degree is not heard in the strings, but as it were a unity. The second or vibratory degree comes to the sense, and indeed by the aid of the most general tremor. 13. A like ratio is in the single senses. 14. *Therefore every sense has its own degrees, superior and inferior, and indeed three, namely, particular, general and most general; for there is order everywhere, and degrees of order, in order that there may be series and correspondence.*

483. 36. *Every sense, of whatever degree, possesses its own maximum and minimum, and the minimum has respect to its own greater and maximum, as unity has to its own number.* 1. In regard to these degrees, which are not from prior to posterior, we must treat in a doctrine of their own, which doctrine is to be called the doctrine of association and series. 2. There is a maximum and minimum as well in the quality of a sense as in the quantity. 3. Every quality of a sense can be increased in quantity, just as the degrees between the maximum and minimum may be multiplied; 4. for example, there is a maximum and minimum in the quality of sound between low and high (*grandem et acutum*), which are said to be differences

of qualities rather than of degree; 5. every such difference in quantity can be increased, that is to say, can be made higher and lower, or it can be stronger and weaker. 6. There are innumerable other qualities in sounds, which qualities also have their own maximum and minimum, as, for instance, sweetness, harshness, softness, the composition of many or fewer, and so forth. 7. All these things can be variously multiplied or rather increased by additions. 8. Qualities in sight are represented by colors, quantities by intensity and weakness of light. 8^a. Qualities in smell are represented by odors, which likewise can be multiplied by quantities. 9. Qualities in taste are divers flavors, which likewise quantitatively acknowledge their maximum and minimum. 10. But who can describe qualitatively the differences of all the senses? 11. they all have their own analogies and harmonies. 12. Let us tarry in the differences of qualities in sounds; they can be varied in three ways, as is apparent in strings; 13. that is to say, by the prolongation or production of the string; 14. or by the thickness or thinness of the string or chord; 15. then by greater or lesser tension of the chord. 14^a. In the ear all those things are most perfectly formed; that is to say, by the prolongation of the nerve or membrane, as appears in the sonorous plate of the cochlea, which increases and decreases in width, for the membrane itself has respect to the nerve, for it is composed of nerves; the result is the same whether we take the membrane or the nerve; then by the thickness of the nerve or membrane, as likewise appears in the same plate, for it grows likewise in thinness and thickness; but indeed a greater or lesser tension is induced by changes of state. 15^a. A like thing obtains in every other sensory organ. 16. But the qualities of every sense must first be sought out, thus those in sight, smell, taste, and touch. 17. Qualities have respect to celerities, wherefore to thickness or thinness, as also to productions. 18. But quantities acknowledge as causes of origin active force, stronger or weaker. 19. All these things are varieties of modes; every sensory organ is formed for these infinite varieties. 20. Thence it follows that the unities acknowledge their own maximum and minimum in every sense;

wherefore so do the fibres ; this is obtained by the diversity of the multitude of the primogenial fibres. 21. Generals also obtain their own maximum and minimum, but more imperfectly than unities, for they are of an inferior degree ; wherefore the organic papillæ which have respect to the first generals of sensation ; this is obtained by magnitude, that is to say by its length and thickness, as was shown above in respect to the plate of the cochlea, wherefore it is obtained by the form of the little organ or papilla. 22. The most generals also have their own maximum and minimum, likewise by diverse magnitude, or length and thickness, which is obtained by the form of the papillæ among themselves, as appears in the sensory of the cuticle and the retina of the eye ; in the cuticle are diverse forms of the papillæ, in the retina is a variant thickness, which is diminished even to the crystalline lens ; it is in the greatest perfection directly opposite to the pupil. 23. The form itself determines these things, whence is every quality. 24. Always the more perfect the form, the superior the degree. 25. *Therefore in every sense, and in every degree of it, there is a harmonic variety.* 26. Whatever therefore agrees with this harmony is grateful, and the reverse. 27. For the most part the forms of the sensories have respect to the form of the circumfluent world ; 28, but in these latter there can be an infinite variety ; for either they approach more nearly, or they go farther away, yea, sometimes into what is contrary, in which case goodnesses are presented as evils, and truths as fables. 29. This especially happens in the inmost sense, which is infinitely susceptible of all varieties, if it does not suffer itself to be driven away from its most perfect form.

484. 37. *All ideas arise from sensations of sight.* 1. But it is to be understood that no ideas arise except from images of sight, or from those things which have respect to images of sight. 2. For images of sight, or the simple rays of sight, or its unities enter into the cortical substance itself and induce a change upon it. 3. Changes of state in the cortical substances are produced and indeed initiated by sight ; 4. thus initiated they remain there under the idea of memory ; when

this change is produced it is the calling forth of an idea from the memory; 5. thence it becomes evident what memory and imagination are. 6. But these are first ideas and imaginations, as it were visual, therefore called the material ideas of the first age, such as are the diverse arrangements of objects, and the harmonies thence arising; but superior or intellectual ideas arise from these latter; one intellectual idea is formed from many imaginative ones. 7. In general it respects the true and the false, the nature of good and evil, or of the present or the future. 8. The idea once formed is also stored up in the memory, for it is presented together in one imaginative idea, which is thus multiplied, and thus enters the composite form of the changes of state. 9. These are the genuine ideas of thought, and are the elements of the sciences, especially the philosophical. 10. Supreme ideas or those of the soul, cannot be said to be ideas, but the representations of ends, which are connate.

485. *Hearing regarded in itself does not produce any ideas, but only refers them under visual ideas.* 1. For the modification of sound does not produce change of state in the single cortical substances in particular; 2. but produces changes among the substances, fibres and connections in the brain, and indeed in a triple degree. 3. From these the soul in its little organs knows which idea corresponds. 4. And the soul is in the imagination which flows in, and thus concurs. 5. Wherefore modification cannot be said to flow into ideas, but ideas flow into the modes of sound. 6. What is superior flows into what is inferior; the inferior only furnishes that into which the superior may flow. 7. But still it appears as if articulate sounds inflow into the single ideas of the memory, but this is a fallacy of our sense; 8. for many languages, many words, diversely sounding, often contrary, present the same idea; thus the ideas of the imagination flow into the modes of hearing or into articulate sounds.

486. *Modes of hearing seem to be able to affect the imagination.* 1. All affection seems to be natural; 2. but it is also obtained by art itself. 3. If all affection were natural, then we would perceive all verities and goodnesses as well the

natural as the moral, as also the spiritual, and we would recognize correspondence. 4. Wherefore the superior faculty can be instructed, to the end that the inferior may be affected according to an order not natural but acquired; 5. wherefore according to verities and goodnesses impressed by a way posterior to the understanding. 6. Thus we understand emotions by the speech of the face, of gestures, of the fingers. 7. Thus those blind from birth learn their ideas from touch at the same time as from sound, if they be not deaf; but this differs greatly from ideas received in sight.

487. *All harmony of posteriors with priors, or of inferiors with superiors, is coestablished, not pre-established*, 1. as between the modes of speech and the ideas of the imagination. We ought to inform the imagination by exercise and culture, as to what idea corresponds to a given sound; as appears from different languages. 2. There is likewise a harmony between imaginative and intellectual ideas, which also must be coestablished, that is to say, by means of sciences, their laws, truths and hypotheses; to these imaginative ideas likewise correspond. 3. So also between the intellectual and representative ideas of our mind there is a coestablished, not pre-established, harmony. 4. It is the affection of the soul alone which concurs. 5. But the affections of the soul and intellectual mind do not concur if other principles contrary to truth and true goodness beset the mind. 6. The idea is one thing and the affection another; the latter results from the form of the ideas. 7. In order, therefore, that the one may flow into the other, the superior into the inferior, that state must by all means be induced, so that the memory may be instructed by experiences, and at the same time by true and suitable rules of the sciences, and that we may remove all inferior affections, and thus may let the soul flow into its own understanding, and this into the imagination, and call forth ideas which it may reduce into order; 8. or rather that those things may be suggested by the memory which are true, and may push nothing actively further, but may let the soul flow into those ideas and reduce them into order. 9. For there is no truth except from the superior, and finally from the supreme. 10. But the soul ought to be in that state, that the affection of the spirit may

flow into it, which cannot be done without spiritual renovation. 11. Affections must flow in order into inferior affections, then there is a true pre-established harmony, and a whole state. 12. For, as has been said, an inferior faculty never flows into a superior, but only furnishes those things into which the superior may flow.

488. *There is something in the forms of inferior modes, sensations and ideas, which naturally affects superior things.*

1. As in speech, in its single sonorous modes, which are sweeter, more grateful and harsher, there are harmonies together with the affections of the animus thence resulting; wherefore there are many similar things in our words, as in the expressions, tinkling, thunder, whistling and endless other expressions, besides many varieties interiorly in the same; if the sound is rendered sharper or graver, it is changed in quality and quantity. 2. In the words themselves joined together as in music, or in speech, when the voice is at one time elevated, at another time lowered, now more quietly, now again varied, altogether according to the affection of the sense in the same expressions; thus by music alone, especially Italian music, we institute a kind of speech more ornately, which moves the affections of the animus; this speech we express otherwise in words. 3. Likewise in speech by means of eloquence, or a harmonious arrangement of words, which affects the understanding itself or the superior faculty. 4. These things bring it about that things said may be more fully and easily grasped and understood, wherefore that art has gone so far that it imitates nature. 5. Hence there is no natural speech, except such as is also noticed in brutes; indeed, that also can be effigied by music and a concert of words.

489. *These things cannot be understood except by means of new doctrines:* 1. namely, by the doctrine of forms, 2. of order and degrees, 3. of influxes, 4. of correspondences, 5. of modifications, 6. wherein these things will all be explained. 7. In the meanwhile we live, as it were, in the shadow of things and although we acknowledge truths, we [perceive] them, as it were, not by sight, but by touch. 8. And they are not even acknowledged except by those whose understanding is immune to hypotheses and false principles. 9. For as has been said all

things are coestablished from the posterior to prior things, not pre-established. 10. Things must first be reduced into true order by these doctrines, and thus we must progress from the prior to posterior things, when first we struggle out thither from the posterior to primes. 11. But still truths are not thus evident, unless the order be so re-established, that the affections of the superior faculties may flow into inferior things; 12. thus not unless the affections of the Divine spirit be received by the soul, thus by the understanding. 13. For it is another thing to receive affections, which proclaim whether the form is truly harmonious, from what it is to receive light, whereby the faculty is continually illuminated, so that it may form its own ideas, and thus dispose them to itself according to proposed ends or the loves of the body. 14. This is given to everyone, but to be affected according to loves, wherefore according to superior truths, this cannot happen, unless supreme affections, while they are flowing in, are received by the proximately inferior faculties. 15. But we will treat of these things in the Psychology. 16. Since all things, which regard our sensitive faculties, must be coestablished, therefore, inferior things always contend with the superior ones; not so when they have been re-established, which is a work of God alone. 17. The determinations of the will are pre-established into act, 18. according to the understanding.

490. *The ideas are what form truths; in the very form of truths, or rather of truths, they produce goodness, thence affections.* 1. Since all ideas must be learned, no truths can be formed except by a posterior way. 2. Ideas must be arranged in suitable form, that thence the form of truth may result. 3. Thousands, yea myriads, of truths must enter into the form of one truth; 4. and when the external senses transmit merely general impressions, and fallacies respectively to interior causes, essences and natures, from this it is evident what quality of truths are formed. 5. First ideas, in themselves of ultimate nature, are the effects or images of sight, each one of which is gifted with its own voice. 6. The ideas afterwards arranged are experiences understood by means of those first ideas. 7. Ideas again compounded are scientific, evolved from experiences, whence are sciences. They are also intel-

lectual. 8. Ideas again compounded are the principles of things, and have respect to spiritual truths.

491. *Truths since they are forms, affect either on account of pure harmony, or on account of the love which is placed for an end.* 1. Truths which affect on account of pure harmony, are all sensations on account of the pure harmony of the parts. 2. There are harmonies and beauties of images, as of the universe, of gardens, of palaces, of triumphal processions, of colors and of faces; thus of all images; 3. because harmonies arise from modifications, there is a harmony in the modifications themselves; as in things musical. 4. There are similar and superior truths, as the philosophical, geometrical, physical, those of many sciences, the causes of effects, the divination of future events from things present, conclusions from many effects, from causes, means, contingents, by the method of inductions, or syllogisms, etc. 5. These truths, since they are not on account of another end than on account of the truth, are pure harmonies, nor can they furnish another affection than a kind of gladness or delectation, as do the organs from the harmonious objects of the senses. 6. These truths are simple and natural goodnesses. 7. But on the other hand, the truths, which look to some love as an end, affect otherwise. 8. They excite some affection for themselves, as, for instance, if they are in the body, for pleasure on account of the love of the body. 9. In the animus they excite allurements on account of the love of the body, such as the possession of riches, and of the goods of the world. 10. In the mind, on account of the love of self, which is called ambition. 11. These are called goodnesses, and are believed to be felicities. 12. The truths of goodness themselves, are that it may be explored whether a good be truly good, and what is the greatest. 13. To inquire after these truths is intellectual, not natural; whatever natural is therein, seduces. 14. For inferior goodnesses fight continually with the superior, to the extent that they appear, as it were, contrary to each other. 15. Avarice which is a goodness of the imagination destroys all the pleasures of the body; ambition, which pertains to the rational mind, or is the love of self, destroys all avarice; spiritual love, or the love of the Deity, destroys all ambition, especially when

the spiritual love is pure, and one does not love God for the sake of the love of one's felicity. 16. Thus they fight constantly. 17. The cause of these combats is our own mode of living, sensating and knowing from posteriors to priors.

492. *Animals recognize the harmonies of things arising from the senses better [than men] for they correspond harmonically with themselves;* 1. for they are all natural harmonies; 2 for they are not referred to any understanding but immediately to some imagination, similar to the visual, and thence to the nature of their soul. 3. Thus while they are ignorant of it they are affected according to the nature of their soul, which is always constituted in order and rule. 4. This happens in insects still more perfectly; for their sense of sight, smell and hearing concur in the same common membrane or meninx. 6. The things which flow into the brain before they flow into the meninx are the images of sight; but those of the rest of the senses flow almost at the same time into the meninx and into the brain; thus their affections are more natural, and those which depend on sight are subjected to the judgment of reason. 7. But these things are too profound and have need to be explained by many things, whereas here they have been expounded only dimly; but these things are obscure, perhaps not true. *I saw a fly. It went away, I drew back.*

493. *It was repeated concerning truths, according to admonitions, as I declare, It returned, I being unwilling, and I scarcely bore it.*

494. *All sensations are forms, either harmonious or unharmonious;* 1. Thus the sensations of touch, taste, smell, hearing and sight; 2. and they are natural; for they result from the forms of objects. 3. Those harmonies persuade, and frequently impose that that also is good which is harmonious. 4. But concerning the goodness which is in it, it is judged by a higher power, which flows in. 5. The influence itself sometimes manifestly appears to be in it, for according to that influx the harmonious sometimes appears as unharmonious and the reverse. 6. Thus a superior affection sometimes persuades the contrary, or against the affection of the sense. 7. For the sense does not grasp what is within the form, or the harmony lies hidden; the sense grasps only what is from the outside.

(*To be continued.*)

THE FIBRE.

TRANSLATED BY THE EDITOR.

CHAPTER V.

THE DETERMINATION OF THE MEDULLARY SUBSTANCE IN THE MEDULLA SPINALIS.

109a. *In the spinal or vertebral canal, this same medullary substance constitutes the circuit or periphery, while the cineritious substance constitutes the axis,—just the reverse of what obtains in the brains. Here are found longitudinal fibres, oblique fibres, and fibres that are circular and spiral; for the longitudinal fibres are fibres of the cerebrum and cerebellum extended to this spine, while the other fibres are proper to the axis itself. These fibres, mutually, as it were, banded together, make a bundle of inextricable texture, and one that cannot be resolved so long as the fibres live in consort. The last fibres terminate in a cone and pursue their course almost in a straight line; the collected bundle of these fibres called the Cauda Equina. By every alternation in the animation of the brain, and also by force of its own cineritious substance, this whole medullary structure is stretched lengthwise, and expanded breadthwise. For between the integuments is a space into which it swells; at the back are cavities; and in front is stretched a longitudinal indentation. But the internal directions of the motion are as many as the nerves which are to issue forth through the cranies of the vertebræ, and to which the directions refer themselves as to their axes and peduncles; these nerves, after they have measured their course through the body, again unfold their fibres. In general, this medullary crust is so expanded and elevated that it surges towards the posterior region of the spine but not towards the anterior. Such is the nature of the determination of the fibres of the medullary substance, the direction of the motions and active forces, and the fluxion of the spirits of the encephalon. From these, by the mediation of the nerves, organic forms and motor powers are raised*

up in the body, and renewed, actuated, and vivified. For according to the state of their formative substance, causes flow into their effects, and forces into their modes, suitably to the intuition and representation of the soul. Wherefore, from its very beginning, the fibre is conceived, born, bent, and determined to a use in the mediates and extremes, which is foreseen and present.

110. In the spinal or vertebral canal, this same medullary substance constitutes the circuit or periphery, while the cineritious substance constitutes the axis,—just the reverse of what obtains in the brains. See above, n. 62-67. Here are found longitudinal fibres, oblique fibres, and fibres that are circular and spiral. That there are longitudinal fibres, and that these are interwoven with fibres running from a center in an oblique and circular direction, that is to say, spirally, is apparent from the downward flux of the fibres from the brains; namely, [1] From their inflexion,—which is fascicular when they enter into the beginnings of the nerves; almost circular in the neck; approaches to a spiral in the dorsum; becomes an elongated spiral in the lumbar region; and finally, in the cauda equina, almost a straight line. [2] From the insufflation of air, or the injection of lymph between the arachnoid and pia membranes, and also underneath the latter; for the injection flows around as though in a circle. [3] Finally, from the fact that this medulla, when exposed to the air, passes off into a humor, and when dried or boiled, falls to dust; this shows that the fibres are interwoven crosswise, and that longitudinal fibres flow into transverse, diametric, oblique, or circular fibres, or, the fibres of the cerebrum into those proper to the medulla spinalis. *For the longitudinal fibres are fibres of the cerebrum and cerebellum extended to this spine, while the other fibres are proper to the axis itself.*

111. These fibres, mutually, as it were, banded together, make a bundle of inextricable texture, and one that cannot be resolved so long as the fibres live in consort. For, as examination shows, there are fibres which are transferred from the right side to the left, and from the left side to the right, and while they are following this course, they are decussated by

other fibres which they meet. From the interweaving of the fibres which thus results, there is formed, as it were, a plaited mat, which is stretched in motion, and relaxed in rest. Thus, and in no other way, are the fibres proper to the medulla spinalis held in consonance with the fibres of the cerebrum and cerebellum, and in obedience thereto; and this, in order that the latter may will and command, and that the former may inflow into the motor fibres of the body, and act.

112. *The last fibres terminate in a cone and pursue their course almost in a straight line; the collected bundle of these fibres is called the Cauda Equina.* What runs through this cone and infills it, is a purely fibrous substance distributed into quasi nerve fascicles, which, when separated from their mutual connections, exhibit the appearance of a horse's tail (*cauda equina*).

113. *By every alternation in the animation of the brain, and also by force of its own cineritious substance, this whole medullary structure is stretched lengthwise, and expanded breadthwise.* Exactly according to the direction of the fibres which are so many little canals capable of extension and expansion, for they are images of the arteries. See the comparison instituted below. [n. 119, seq.] *For between the integuments is a space into which it swells; at the back are cavities; and in front is stretched a longitudinal indentation.* Here we meet similar phenomena, as those noticed above in the description of the medulla oblongata. [n. 105-107]. The same remark also applies to what follows, namely, *But the internal directions of the motion are as many as the nerves which are to issue forth through the cranies of the vertabræ, and to which the directions refer themselves, as to their axes and peduncles.*

114. *These nerves, after they have measured their course through the body, again unfold their fibres.* The case is not unlike that of the peduncles of the cerebrum and cerebellum, concerning which we have already observed that they first gather together the scattered fibres, and then send them forth in every direction; almost like the trunk of a tree which sends out its roots on the one side, and its branches and leaves

on the other. Such also are the nerves, which finally unfold themselves into organic forms, as into so many branches and twigs.

115. *In general, this medullary crust is so expanded and elevated that it surges towards the posterior region of the spine but not towards the anterior.* Compare what has been said above, n. 109. For the anterior part of the medulla spinalis adheres somewhat closely to the dura mater or thick involucrum; but its posterior is slightly removed from this covering. There are, moreover, many other confirmatory indications, as, for instance, the cavities at the back, and the corrugations of the posterior spinal arteries and veins, etc.

116. Now follows the end and use, which I simply adduce without making any comment, namely, *Such is the nature of the determination of the fibres of the medullary substance, the direction of the motions and active forces, and the fluxion of the spirits of the encephalon. From these, by the mediation of the nerves, organic forms and motor powers are raised up in the body, and renewed, actuated, and vivified. For according to the state of this formative substance, causes flow into their effects, and forces into their modes, suitably to the intuition and representation of the soul.* Add to this the observations made in Trans. I., Chapter iii. [n. 247, seq.]

117. *Wherefore, from its very beginning, the fibre is conceived, born, bent, and determined to a use in the mediates and extremes which is foreseen and present.* For the fibres of the olfactory, optic, acoustic, and gustatory nerves, go straight from the bosom of their medulla as soft fibres; the other fibres are somewhat firmer, and harder, and are bound together in stouter tunics. Some, from their very first motion and step, are deeply conscious of the society into which they are to enter, and therefore, even from the womb, they at once separate themselves from their companions, and pick out an entirely different path. Such is the case with the spinal nerve,* which ascends through the occipital foramen to the eighth

*Called also the spinal accessory nerve.

pair* of the head,—to say nothing of like departures in the case of other nerves, especially after they have entered the kingdom of the body, where they diligently seek out and come across companion sensory and motor nerves, to which they ever and anon adjoin themselves. Surely, no such thing would happen unless this activity and determination were impressed upon them by some superior mind which is concealed from our inferior mind, and which sends forth ministering fibres, like so many rays, for the performance of its ordinances, and the carrying out of its decisions.

CHAPTER VI.

ON THE SIGNIFICATION OF TERMS IN NEUROLOGY.

117a. *But since the medullary substance is made up of fibres and vessels, and of other ducts emulous of the fibre and vessel, all mutually interwoven and joined together by anastomosis; and also of the various kinds of lymphs and serums which course between them; it is necessary for the science of anatomy, and here, in particular, for the science of neurology, that each of these constituent parts be given its own proper name, and that the meanings of these names be explained. That is called a Fibre which draws its origin from the cortical substance; a Vessel, which draws its origin from the heart; and a Duct, which draws its origin from a gland; or, what comes to the same thing, a Fibre is that which conveys the purest animal fluid, a Vessel that which conveys the blood, and a Duct that which conveys all other humors. The fibres of the brain are called medullary fibres, and their continuations in the body are nerve fibres. Fibres, therefore, de-*

*The par vagum. The spinal accessory nerve rises from the medulla spinalis of the neck, ascends to the brain through the occipital foramen, and there joins the par vagum, or sympathetic

nerve. In company with this nerve it again passes through the occipital foramen. It then separates from the vagus nerve and is distributed to the trapezius.

scend from the superior kingdom, or kingdom of the brain, into the inferior kingdom, or kingdom of the heart, while vessels, on the other hand, ascend. But whether we say fibre, or vessel, or duct, they are all nevertheless little canals, because hollow and permeable. But because, in universal nature and the kingdoms of nature there exists order and degrees of order, therefore there are simple and compound fibres, simple and compound vessels, and simple and compound ducts. Therefore, by reason of composition, there are fibres of the first, of the second, and of the third order, in which respect fibres make one with vessels and ducts. Moreover, there are vessels of a middle nature, both in respect to their origin, and in respect to the fluid which they convey; these we call vessels emulous of the fibre. But motor, fleshy, muscular, tendinous, brawny, and even cartilaginous and osseous fibres, must be derived from genuine fibres, vessels, and ducts. On the other hand, sprigs, branches, shoots, foliage, sprouts, boughs, capillaments, cords, stamens, villi, threads, funicles, strings, stems, trunks, fascicles, and bundles, are names common alike to the family of fibres, and to that of vessels and ducts.

118. But since the medullary substance is made up of fibres and vessels, and of other ducts emulous of the fibre and vessel, all mutually interwoven and joined together by anastomosis; and also of the various kinds of lymphs and serums which course between them, it is necessary for the science of anatomy, and here, in particular, for the science of neurology, that each of these constituent parts be given its own proper name, and that the meanings of these names be explained. As, for instance, what, in particular, is denoted by fibre, what by vessel, and what by the other principles and objects of the science of angiology. Anatomists use these words promiscuously, for some call a fibre a vessel, and others a vessel a fibre, each one using the terms according to the individual ideas which he has conceived respecting the things meant. Thus each one interprets the term in accordance with his understanding of the thing. Hence, from terms arise so many disputes respecting things, and from things respecting terms.

But to choose suitable and simple words and to bring out the innermost meaning of these words, is impossible, except to one who has a profound knowledge of the essence and nature of the thing to be expressed. Who, pray, can give a true definition of the fibre if he be ignorant of its origin, nature, and functions? Will he not take a capillary vessel, or the ultimate ramification of some artery or vein, to be a genuine fibre?—for they are alike in tenuity and in appearance. This is the reason why the one term is substituted for the other promiscuously.

119. *That is called a Fibre which draws its origin from the cortical substance.* Add here Trans. II., n. 111-117. This signification of the term Fibre agrees also with the signification commonly accepted. For fibres are called fibres of the brain, and their continuations fibres of the nerves. Hence fibres are distinguished from vessels by the fact that each one of them enjoys its own individual origin from which it derives its particular nature. In this way, also, is the term fibre understood by the mind, which is the parent of ideas or the mistress of words. *A Vessel, which draws its origin from the heart.* Therefore it is called a blood vessel, and, in particular, an artery or vein. This nomenclature, however, causes no dispute, for it is in received usage among anatomists. *And a Duct, which draws its origin from a gland.* Hence we have secretory, excretory, lymphatic, serous, lacteal, bile, pancreatic, salivary, chyliiferous, seminal and many other kinds of ducts. For the peculiar office of glands is to prepare humors of this nature, and, when they are prepared, to send them forth, that is, *educe* them, through little channels to specific and particular uses. Some, indeed, call these ductules vessels; but I think the term unsuitable because they differ from the vessel in origin, nature, and function. How manifold in the body are the origins of such ducts, may be learned merely from examination under the microscope; for in the cuticles, in the single viscera, yea, in the arteries and veins, they constitute entire membranes, which are commonly called glandular. The names given above have been drawn from the origins of the things named, but they will also be found suit-

able if we base our nomenclature on the fluids which they convey. And so follows the induction, *Or, what comes to the same thing, a Fibre is that which conveys the purest animal fluid, a Vessel that which conveys the blood, and a Duct that which conveys all other humors.*

120. *The fibres of the brain are called medullary fibres, and their continuations in the body are nerve fibres. Fibres, therefore, descend from the superior kingdom, or kingdom of the brain, into the inferior kingdom, or kingdom of the heart, while vessels, on the other hand, ascend.* The inferior animal kingdom is the body proper, which is built up from the blood and its vessels, and is therefore called the kingdom of the heart. In this kingdom are actions or executions, that is to say, effects and external sensations. The superior kingdom is the brain, wherein are fibres with their animal spirit. More especially, it is the kingdom of the cortical substances, for in these is the beginning of the brain. In this kingdom are the causes of effects, and here are volitions and internal sensations. There is also a supreme kingdom, where is the purest and vital essence of the blood, and to which fibres may be attributed by eminence. In this kingdom are the beginnings of determinations, the intuitions of ends, and the first representations of things,—consequently the soul itself. Such, then, is the number of the kingdoms into which the animal imperium is seen to be divided,—but to explore the mutual and reciprocal influx of the one kingdom into the other, is to explore the commerce of soul and body.

121. *But whether we say fibre, or vessel, or duct, they are all nevertheless little canals, because hollow and perineable.* But on the permeability of the fibres, even the most minute and simple, see what follows.

122. *But because in universal nature and the kingdoms of nature there exists order and degrees of order, therefore there are simple and compound fibres, simple and compound vessels, and simple and compound ducts.* On the series, degrees, subordination, and co-ordination of all things in created nature, see Trans. I., Chap. viii. [n. 579, seq.] In that chapter I have by no means intended the simple to be understood as

meaning what is devoid of all dimensions, space and extension, but as meaning every single first in the order of the compositions, of each genus; for the absolutely simple must be sought for entirely outside of nature. *Therefore, by reason of composition, there are fibres of the first, of the second, and of the third order, in which respect fibres make one with vessels and ducts.*

123. *Moreover there are vessels of a middle nature, both in respect to their origin, and in respect to the fluid which they convey; these we call vessels emulous of the fibre.* For there are little channels which sometimes, like fibres, carry animal spirit, and sometimes, like vessels, carry the purest serum, almost as is the case with the lymphatic vessels or thoracic ducts, which sometimes carry chyle, and sometimes pure lymph. As regards their origin, however, these vessels spring from their own follicles, cells, vesicles, or glands, especially from the subcutaneous glands; and, on their way to the cortex of the cerebrum, they commingle with genuine fibres, besides constituting the cortical substance from which the fibres are continued. By means of this two-fold aspect they are vessels of a mediate nature, or vessels emulous of the fibre. But what vessels belong to this class, and what their quality, is a matter for particular exposition.

124. *But motor, fleshy, muscular, tendinous, brawny, and even cartilaginous and osseous fibres, must be derived from genuine fibres, vessels, and ducts.* All things are soft in their origin, even those matters which in time grow hard and bony; for the hard arises from the soft, and the soft which is continuous and coherent, from that which is contiguous and fluid. For unless beginnings were fluid, and thus enjoyed free power of action, their continuations could never be disposed to the will of fluids. What is compounded must be compounded of parts, and if of parts, these parts must be prior to their compound. Thus, within the concrete or the continuous aggregate, are produced predicates which are suitable to the fluidity of the parts, and to their power and nature of acting freely. This is confirmed by the mere anatomy of the embryo in the womb, and the chick in the egg, and, also, by the experience of the eye itself, which shows that motor or flesh fibres consist

of coalesced vessels, fibres, and ducts, that tendinous fibres arise from flesh fibres, cartilaginous fibres from tendinous, and osseous fibres from cartilaginous,—and this by the mere force of inertia, or by the privation of active forces, that is, of vital motions. *On the other hand, sprigs, branches, shoots, foliage, sprouts, boughs, capillaments, cords, stamens, villi, threads, funicles, strings, stems, trunks, fascicles, and bundles, are names common alike to the family of fibres, and to that of vessels and ducts.*

CHAPTER VII.

THE MEDULLARY SUBSTANCE IN GENERAL.

124a. *The medullary structure of the cerebrum, using the term cerebrum in a broad sense, is made up solely of fibres, vessels, and ducts, wonderfully intertwined with each other. But the first place is held by fibres, which have their origin in the brains; for they are produced from the cortical substances as from so many most simple and perfect little hearts, brains, glands, muscular grains, or matrices. The second place is held by arterial vessels, which, passing by the cortex and continually ramifying, betake themselves to the medullary body, and there commingle with genuine fibres. There are also vessels of a middle nature, or vessels emulous to the fibre, which are taken from the tunics of the arteries and from the pia meninx, and are inserted among genuine vessels and fibres, in order that they may perform their own particular function. There are also little ducts, though few in the healthy brain, which are produced from glands that frequently come into existence, and which take on the appearance of a compound fibre. That there are so many kinds of little canals and filaments in the medullary structure of the cerebrum, cerebellum, medulla oblongata and medulla spinalis, is declared by the evidence of sight. These threads, diverse in origin, nature, and function, mutually consociate and distinctly enfold themselves into reticular plexuses.*

125. *The medullary structure of the cerebrum, using the*

term cerebrum in a broad sense, is made up solely of fibres, vessels, and ducts wonderfully intertwined with each other. By the cerebrum, used in a broad sense, is meant, not only the cerebrum in particular, but also the cerebellum, medulla oblongata, and medulla spinalis, or all that which goes under the name encephalon; that is to say, the superior and prior part of the animal kingdom.

126. *But the first place is held by fibres, which have their origin in the brains; for they are produced from the cortical substances as from so many most simple and perfect little hearts, brains, glands, muscular grains, or matrices.* That genuine fibres have their origins in the brains, will, I think, be denied by no one, if he stops to consider that in the incubating chick, and in embryos, the cerebrum, using the term in a broad sense, exists before the heart, lungs, and other viscera, the pure and white ichor before the blood, and the most tender fibres, which are the first begotten, before the veins and arteries, which are compounds of the fibres. For it is plain to be seen that the fibre is emitted from the cerebrum for the purpose of framing the little machine of the heart itself, and not the reverse. Therefore, not only the motor fibres and the coronary vessels, but also the very motion of the heart, all depend on the cerebrum as on their efficient, impelling, and perpetually continuing force, as may be seen demonstrated by abundant experience in Trans. I., Chap. iii. [n. 241, seq.] Therefore it is the cortex, or this corcular substance of the cerebrum, which puts forth the fibre, whence arise the nerves, arteries, and veins, from which exist all the other parts in the kingdom. That the cortex is situate in the first term of the fibres, see Trans. II., n. 111, 114, 115; that it is like a little heart, *ibid.* 132-139; that it is like a little brain, *ibid.* n. 191-196; that it is an eminent gland, *ibid.* 183-190; like a muscle, *ibid.* 176-182; like a womb, *ibid.* 190; in a word, that we may attribute to it, by eminence, everything whatsoever that performs any kind of office in the animal kingdom, *ibid.* 176. But the terms heart, little brain, (*cerebellum*); gland, and muscle, are all names pertaining to compounds and not at the same time to simple substances; wherefore, in order

that they may, by analogy, be applied to these latter, they are called most simple and perfect little hearts, little brains, glands, and muscles. Confer, Trans. I., Chap. viii., sec. 5 and 6. [n. 612-627.]

127. But it is of importance that I here pause a little, in the treatment of the origin of the medullary, and hence of the nerve fibre, and gather together the opinions of the learned for the sake of confirming the above point, namely, that the fibre must arise from the cortex. For the very definition of fibre and a knowledge of its nature, depends on an exploration of its genesis. The most acute investigators, such as Malpighi, Vieussens, Ridley, Willis, Boerhaave and others, confirm the point by the weight of their opinion, because experience supports it.

MALPIGHI speaks as follows: The outer portion of the cortex is covered over by the pia mater and its blood vessels, which penetrate deeply into the substance of the glands; their inner portion puts forth a white nerve fibre like a true vessel, as the lucidity and whiteness of these bodies permit us to observe. Therefore the white medullary substance of the cerebrum results from the connection and confasciculation of a multitude of these fibrils; and if the nature of the cortex may be explained by a familiar example, no better one would occur, than the structure of the pomegranite." [*sup.*, n. 19.] "Since a large quantity of the cortical substance is observed in the ventricles and at the head of the medulla spinalis, where are situated, the interior prominences; and since, when these prominences are laid open, fibres are observed, which are continuations of the nerves, we must perforce conclude that the nerves themselves are also produced from these interior glands." [n. 20.] "This is undoubtedly true, namely, that every single gland of the cortex is bedewed from the extreme ends of both arteries and veins." (*ibid.*) "You will also observe the same structure in the extreme appendices of the corpus callosum; for the fibrous structures of which the arch of the ventricles is woven, finally end in, as it were, ragged fringes, or in productions after the manner of gyres, and these, not unlike the multitudinous roots of plants, are immersed and implanted in the

cortex, which thus serves the turn of soil or earth." (n. 21, and Trans. II., n. 76, 78, 80.)

VIEUSSENS: "The medullary or white substance in the cerebrum, cerebellum, and medulla oblongata, is so closely applied to the cineritious substance that the two coalesce." (n. 17.)

RIDLEY: "These final vessels, I hold, are nothing but the numerous still further capillary productions of the cortical vessels. (n. 18.)

WILLIS: "Its parts, in respect to the encephalon and the medullary appendix, are like a branching shoot, growing about the trunk of a tree, that is, if we take the cortical substances of the cerebrum and cerebellum as the roots, and the whole medullary substance as the stem and bark." (n. 5.)

BOERHAAVE: "The outer, cineritious, [soft], and more humid substance is called the cortex of the cerebrum and cerebellum. It everywhere closely invests the origin of the other substance, which is within, is extremely white, more solid, and less juicy, and is called the medulla of the cerebrum and cerebellum. It is clearly manifest, therefore, that the latter everywhere first arises from the former, both in the appendices, the ventricles, the crura, and the medulla oblongata. But in the interior of the medulla spinalis, on the other hand, is found a substance similar to the cortex, being in like manner wholly arterial; but it is here surrounded by the medullary substance, which is just the reverse of what obtains in the former case. In the cerebellum, these two substances are so conspicuous that the manner in which the medulla proceeds from the cortex, and the distinction between the two, their proportion, and fabric, can all be clearly discerned. It can also be seen that the cortex here is always harder and more yellowish than the cortex of the cerebrum." (n. 45.)

If we contemplate the cortex when exposed in living brains,—examining it either through a microscopic lens or in a drawing from life,—we shall plainly see how the fibre proceeds from it, springing forth like a rivulet from its fount. The same is also confirmed in the case of those afflicted with hydrocephalus, apoplexy, catalepsy, paralysis, mania, convulsions, and cynic spasms; for in such persons, as shown by

post mortem examination, the disease of the cortical substances is derived into the fibres continued therefrom, and, finally, into the muscular fibres, whence arise the meaningless actions and motions. Moreover, the physiological phenomena of the [animal] kingdom also [add their confirmation by showing] that, in the cerebrum, exists a last and a first,—a last, to which sensation tends, and where it unfolds itself, passes around, and looks about; and a first, from which activities flow down into the motor fibres of the body, whence arises motions; and this, in order that the last of sensations may be in that place where is the first of active forces. And because the cortical substance is the parent of the fibre, it therefore follows that it is in this, its own substance alone that the brain begins to be a brain; for here is the receptacle of sensations, or the common sensory, and, together with it, the beginning of actions, or the common motory. For this reason a gyre, or rather a turning, is set up, namely, from sensation to perception and from perception, by means of the will, to action.

(To be continued.)

THE NEW PHILOSOPHY.

VOL. XIII.

JULY, 1910.

No. 3.

TRANSACTIONS

OF THE

THIRTEENTH ANNUAL MEETING

OF THE

SWEDENBORG SCIENTIFIC ASSOCIATION.

The Thirteenth Annual Meeting of the Swedenborg Scientific Association was held at Odd Fellows' Temple, in the City of Philadelphia, on Monday, May 16, 1910.

AFTERNOON SESSION.

1. The meeting was called to order by President Sewall at 2 P. M.

2. The minutes of the Twelfth Annual Meeting were approved, as printed in the *New Philosophy* for July, 1909, and the reading of them was dispensed with.

3. The Chair appointed Mr. Emil F. Stroh a committee on the Roll. The committee reported the following members and visitors in attendance:

Members: Rev. Alfred Acton, Rev. W. H. Alden, Mr. Ed. Boericke, Dr. F. A. Boericke, Rev. Reginald W. Brown, Rev. C. E. Doering, Miss Wilhelmina Doering, Miss Sophie Falk, Mr. Gerald S. Glenn, Mr. L. E. Gyllenhaal, Miss M. C. Hogan, Rev. E. E. Iungerich, Mr. K. Knudsen, Rev. C. Th. Odhner, Rev. W. F. Pendleton, Mr. John Pitcairn, Miss Vera Pitcairn, Dr. Frank Sewall, Rev. J. B. Spiers, Mr. E. F. Stroh, Mr. A. L. Tafel.

Visitors: Miss Stella Bellinger, Mr. Gideon Boericke, Miss Carrie Doering, Mr. Henry Doering, Mr. A. T. H. Frank, Miss A. E. Grant, Mrs. Henderson, Miss Solange Iungerich, Miss Anna Klein, Mrs. K. Knudsen, Miss Francie McQuigg, Mr. Louis Pendleton, Miss Edith Potts, Rev. E. S. Price, Mr. Gilbert Smith, Mrs. H. G. Stroh, Mr. Robt. R. Tafel, Mr. Wm. Whitehead.

4. The TREASURER'S REPORT was presented and placed on file.

5. The Chair appointed the Rev. C. E. Doering and Dr. F. A. Boericke auditors.

6. The BOARD OF DIRECTORS reported two meetings;—one held on May 8, 1909, for the election of officers, and the second on May 16, 1910. The Board also reported that, at the invitation of the London Swedenborg Society, the Rev. Alfred Acton had been appointed to represent the Association at the International Swedenborg Congress. In addition, the Board had set the time of the Thirteenth Annual Meeting.

7. The meeting ratified the appointment of the Rev. Alfred Acton as its representative at the International Swedenborg Congress.

8. A report from MR. ALFRED H. STROH outlining his work in Sweden during the past year was read.

9. The EDITOR of the *New Philosophy* reported that the journal had been conducted along the lines expressed as desirable at the last annual meeting, the *New Philosophy* now being devoted almost wholly to the publication of translations from Swedenborg; 44 pages out of a total of 140 had been devoted to the work on the *Senses* and 51 to that on the *Fibre*. The editor also reported that six parts (pp. 1-96) of the *Senses* had been reprinted in an edition of 500 copies and are now for sale, and that it is expected that six or seven more parts will be issued during the summer and fall. Two parts of the *Fibre* have been reprinted in an edition of 1,500 copies and reprints of two more parts will follow soon. Reprints have also been made of the President's Annual Address and of Mr. A. H. Stroh's report. In addition, the Editor, after consultation with the President and Treasurer, and with the

consent of the publishers of *New Church Life*, ordered the reprint from type belonging to that journal of Swedenborg's suggestions for a flying machine together with descriptive plate. To this reprint, of which 250 copies were made, the Editor added an introduction, the whole making a pamphlet of 16 pages.

10. The Committee on the publication of *DE SALE* reported that owing to many other duties it had been impossible to prepare the remaining copy, consisting of preface and critical notes, necessary for the completion of *De Sale*. The matter is now in course of preparation and it is expected that the work will appear during the summer or early fall.

11. The Committee on the translation of *DE SENSIBUS* reported that the translation will probably be completed about the middle of August. The Committee recommended that a committee be appointed to properly index the work and presented the question as to whether the chapters (on Touch and Taste) which had been found to be missing from the Latin edition should be inserted in their proper place in the middle of the work when published in book form or be put at the end. It was pointed out that the former course would involve considerable labor and delay.

12. The place for inserting the missing chapters of *De Sensibus* was discussed at some length, the general opinion being that in order to avoid delay it would be better to place them at the end, with a note explaining that they had been discovered in the MS. after the numbering and printing had advanced beyond the proper place for insertion.

13. It was stated that Mr. E. E. Iungerich has transcribed the parts in question; and upon request Mr. Iungerich outlined their contents in a general manner to the meeting, showing that they were important and should be included. (See Minute 22.)

14. The Committee on the translation of the *EARLY SWEDISH TREATISES* reported the completion of the translation of the *Dædalus Hyperboreus*. The translation had been several times offered to the London Swedenborg Society for publication, but no reply had been received.

15. The AUDITING COMMITTEE reported that though the cash book was not on hand the treasurer's report was found to tally with the bank book. The report of the Committee was accepted.

16. It was voted to have copies of Mr. Stroh's report printed for presentation to the General Convention and to the Academy of the New Church in the interest of Mr. Stroh's support.

17. A communication from Mr. James Speirs, secretary of the London Swedenborg Society, was read, announcing a meeting in London, during July, of representatives of the various bodies immediately interested in and supporting Mr. Stroh's work in Sweden in order to discuss the general question of the co-operation in the work to be accomplished there and the apportionment of Mr. Stroh's time to the various phases of the work. The matter was referred to the Board of Directors.

18. At 3 P. M. the President delivered his annual address on SPIRIT AS OBJECT or The Objectivity of the Spiritual World.

19. The question of having a definite understanding and arrangement with the other bodies concerned as to the apportionment of Mr. Stroh's work was brought before the meeting by the Chair. The general opinion was that the work is at present too diffuse and that things of comparatively temporary importance absorb too large a proportion of time, the reproduction, publication and preservation of Swedenborg's manuscripts being the thing of most vital and permanent value.

20. The following officers were elected for the coming year:

President: Rev. Frank Sewall, A. M., D. D.

Directors: Dr. F. A. Boericke, Mr. Horace P. Chandler, Rev. Chas. E. Doering, Rev. H. Clinton Hay, Rev. Alfred Acton and Rev. Reginald W. Brown.

21. After some discussion it was voted that the President's Address and the Transactions of the Annual Meeting should

appear as usual in the July issue of *New Philosophy* and that the number of pages in the issue should be increased so as not to decrease the regular amount of translation appearing in the journal. It was also voted to reprint, in addition, 100 copies of the Address for the use of Dr. Sewall.

22. It was *voted* that the parts of *De Sensibus* on Touch and Taste should be included in the translation of *The Senses* when it appears in book form.

23. Mr. Iungerich read a paper attempting a correlation of the series of entities in the *Argumenta*, *Lesser Principia* and *Principia*. The paper aroused a number of questions and considerable discussion.

24. The meeting adjourned at 6:10 P. M.

EVENING SESSION.

25. The meeting was called to order at 8 P. M., being opened by an interesting discussion of Dr. Sewall's address.

26. A Paper by G. W. Worcester was read on the "Correlation of Swedenborg's Cosmology and Theology and the place of the Principia in his Writings."

27. Various members present rose to express their appreciation of the paper and of the very thorough study to which it bore evidence. It was *moved* that the Secretary impart to Mr. Worcester, on behalf of the meeting, an expression of appreciation and thanks.

28. The Association had still another paper by Mr. Alfred H. Stroh on "Swedenborg's University Period and Earliest Works," but as the time was growing late it was *moved* that with Mr. Stroh's consent the paper be offered to some New Church periodical for publication.

29. The meeting adjourned at 10 P. M.

FINANCIAL STATEMENT.

May 12, 1910.

RECEIPTS.

Balance on hand as per last year,		375 59
Membership dues,	179 00	
Subscriptions to New Philosophy,	122 66	
Contributions,	50	
	<hr/>	
	302 16	

Sale of S. S. A. publications: Summary of the Principia, 2; S. & P., Treatises, 3,	1 32	
Royal Academy publications sold,	4 00	307 48
	<hr/>	
		683 07

EXPENDITURES.

Printing New Philosophy, April to January,	149 39	
Paper for New Philosophy,	13 50	
Envelopes " "	1 50	
Addressing envelopes.	4 00	
Advertising,	5 00	
Paper for reprints,	42 00	
Expenses to Lancaster of Editor N. P.,	3 03	
Rent of room for annual meeting, 1909,	5 00	
Miscellaneous, expressage, telegrams, postage and stationery,	39 65	263 07
	<hr/>	
Balance as per cash book,		420 00

The above balance of \$420 includes balances carried on the following special accounts:

Swedenborg MSS.,	4	31	
Royal Academy publications,	4	00	
“ “ “ plates,	2	00	
Worship and love of God,	11	60	21 91
			<hr/>

SUBSCRIBERS TO THE “NEW PHILOSOPHY.”

Total, May 8, 1909,	227	
New Subscribers,	23	250
	<hr/>	
Discontinued by request,	8	
Deceased,	3	11
	<hr/>	<hr/>
Present list paying subscriptions		239
Free, 57; Exchanges, 15.		

ACCOUNTS DUE.

91 members owe for dues,	149	00
85 subscribers in arrears, owe	99	00
	<hr/>	
Total outstanding for dues and subscriptions,	248	00

MEMBERSHIP.

Total membership reported May 8, 1909,	188	
New members,	15	203
	<hr/>	
Members resigned,	2	
Members deceased,	3	5
	<hr/>	<hr/>
Present membership,		198

EMIL F. STROH,
Treasurer.

NEW MEMBERS RECEIVED DURING THE YEAR.

De Riviere, Wm. La Baronne E. Arnos, 303 Spring Hill Ave.,
Mobile, Alabama.
Dandridge, Miss Serena K., 1726 Q St., Washington, D. C.
Mason, R. C., Greystone Park, Yonkers, N. Y.
Alden, Rev. W. H., Bryn Athyn, Pa.
Pitcairn, Raymond, Bryn Athyn, Pa.
Hogan, Miss Maria C., Bryn Athyn, Pa.
Glenn, Miss Mildred, Bryn Athyn, Pa.
Mack, Dr. Chas. S., 2353 Maplewood Ave., Toledo, O.
Doering, Miss Wilhelmina, 1622 Mt. Vernon St., Phila., Pa.
Nelson, Seymour G., Glenview, Ill.
Iungerich, Rev. E. E., Bryn Athyn, Pa.
Campbell, Mrs. A. G., 181 Stratford Rd., Brooklyn, N. Y.
McLaughlin, S., 450 E. 10th St., Los Angeles, Cal.
Crowther, Mrs. Eleanor H., 202 S. Broadway, Laurence,
Mass.

MEMBERS RESIGNED.

Hanlin, Dr. W. A., Middleport, O.
Mann, Rev. Chas. H., Los Angeles, Cal.

MEMBERS DECEASED.

Cooper, Dr. Geo. M., Bryn Athyn, Pa.
Iles, Henry W., Southend-on-Sea, Eng.
Mayhew, Rev. Wm. H., Yarmouthport, Mass.

ADDRESS BY THE PRESIDENT.

SPIRIT AS OBJECT

OR

THE OBJECTIVITY OF A SPIRITUAL WORLD.

The slow progress in the issuing of the third volume of the Royal Swedish Academy's edition of Swedenborg's Scientific Works, a delay which is explained elsewhere, and the continued postponement of the publication of the long awaited London edition of the *Principia* and the Rotch edition of the *Worship and Love of God*, leaves us where we were a year ago so far as concerns the actual appearing of new volumes of Swedenborg's Scientific Works. But our Association has continued its contribution of no inconsiderable value to this ultimate end in producing from the pages of its quarterly—the *New Philosophy*—a number of separate instalments of the two important works introductory to the *Rational Psychology*—namely, the work on the *Senses* and on the *Fibre*, both now first translated from the Latin and in a form when the separate sheets are bound together to make the complete volumes under these titles. To this we should add the mention of the publication by subscriptions, now assured, of the work on *Generation* which has for many years been out of print, but which holds an important place in the physiological series of the *Regnum Animale*.

Meanwhile that it is not through publications alone that public interest has recently been aroused in Swedenborg is quite evident from the results in a literary way that have followed the imposing public ceremonies incident to the removal in state of Swedenborg's remains from London and their being placed in the cathedral at Upsala, where they now await the monument to be erected over them by direction of the Swedish Parliament. During the two years that have elapsed since that event no less than seven works in the form of books or

periodical publications have appeared in Sweden by authors of literary prominence, not including the volume and the lectures published by the professed followers of Swedenborg, Messrs. Stroh and Manby. While this with the increasing familiarity with Swedenborg's name, at least through literary channels in America and Europe, shows unmistakably that Swedenborg has a certain vital hold on the thought and investigation of the present day unlike that of any philosopher, scientist or mystic of his own time, still we have to notice that the attention, especially among the European scholars, dwells mainly on Swedenborg's science as such and does not touch the deeper philosophy of his system regarded as a whole, still less that part of it which he himself actually designates as the *Sapientia Angelica*, as if denying to it any origin from purely natural science and invention.

While it may be quite in accord with the true principles of natural science to thus confine its attention strictly to the plane of the material and physical and to stand shy at any philosophy, still more at any science that ventures into the world transcending time and space, yet the scientist of today must admit that it becomes more and more difficult to draw the dividing line between these two worlds, namely, of material and of spiritual substance; and that youngest daughter of Science, the new psychology, would seem to be rapidly leading her mother into new fields of speculation where the terra firma of the former factual knowledge seems to be growing constantly more thin and trembling.

As followers of Swedenborg we do not forget his warning not to attempt to enter into spiritual truth, or construct spiritual truth out of the facts of nature, but rather to investigate and employ the facts of nature in the light of the truth revealed from the higher realm of spirit. At the same time we are confronted with the unique fact in Swedenborg's experience and direct teaching that the world of spirit, according to his testimony, has itself become an object of strictly scientific knowledge—so far as that knowledge may be called scientific that comes to us from without, that is, from things *seen and heard*; and this is precisely the knowledge that Swedenborg brings to us of the spiritual world—*ex visis et auditis*.

Now so long as men regard spirit as something purely subjective, that is, as existing within oneself and not without oneself, such a thing as a world of spirit must be regarded as entirely unreal—in the sense of having no objective—outside reality. Feeling and thought we say have only subjective existence; they are only inside and not outside of us and so must any world we feel and see outside of us be either *material*—that is, endowed with a being entirely independent of us,—or else such a world must be merely ideal or composed of the ideas of our own minds projected in imagination out of ourselves and so producing the *illusion* of an objective world. The latter theory is that which is commonly named idealism, and it means in a word that the world borrows all its reality from the imagination of the individual mind.

It is interesting to notice here the form of idealism exhibited in one of the most novel and recent speculations of the pragmatism of the day in its so-called search after Truth. Assuming truth to be the inmost reality and that the only reality known to man is that of his sensuous or his volitional experience, it follows according to the prophets of this latest phase of psychological science* that truth is no objective fixed eternal thing or standard, but that it is ever in the process of making as our ideas developed by our momentary experience attain to a sense of satisfaction. With the disappearance of truth as an eternal objective norm or form, so there disappears every symbol of such truth as a single and independent reality; and there are as many truths, nay as many gods, as there are minds and we have a pluralistic universe, each man being a world as well as a god to himself. Also as a factor to this ancient and abandoned idea of a standard, objective truth the intellect of man with its inherited traditions of reasoning *a priori* or from accepted authoritative premises is likewise set aside under the name of "vicious intellectualism," and the very term rationality is becoming obnoxious owing to its habit of substituting fictitious things of the intellect in the place of the realities of experience. So absolutely dependent on the "indi-

*See Professor William James in "Pragmatism" and "The Meaning of Truth."

vidual experience" does the objective world, even the universe in the concept of God, here become that we may regard the whole system of "radical empiricism," so called, as the extreme but inverted form of absolute idealism.

And it is here that Swedenborg confronts the thought of today with his doctrine of an objective spiritual world—a world whose substance is most real, whose form is most visible and yet whose substances and forms are purely things of mind or spirit and not of matter. He presents these doctrines not as things *a priori* nor of revelation, but as the teachings of experience to things heard and seen. We are entitled indeed if so inclined, to accept the teaching simply as dogma without further inquiry into the relation of such a doctrine to our actual human experience or into the possibility of the human mind's conceiving of spirit as an entity existing outside of individual minds and so as constituting the environment of those in a spiritual world. The problem far from being ignored by Swedenborg himself is very graphically presented in one of his MEMORABILIA [T. C. R. 64], where some newcomers into the world of spirits, on being introduced into a company of learned Greeks and shown their library, expressed their wonder at there being books and parchments and pens and ink in the spiritual world, and the reply is made: "We perceive that you believed in the former world that this world was empty because spiritual and you believed this because you cherished an idea of the spiritual as abstracted from the material; and what is abstracted from the material appears to you as nothing and thus as empty, when yet there is here a plenitude of all things. All things here are substantial and not material, and material things derive their origin from substantial things."

It may well be that many students of Swedenborg find themselves in the same quandary—wondering what is that substance of things outside of themselves in the spiritual world entirely abstracted from matter. Can it be anything? and if so, what? If it is not the self-perfected world of the pragmatists' idealism having its only reality in the experience of the beholder or percipient, then its reality must be derived

from a source outside of self. There must be, in contradiction to the pragmatist—not only an external standard of objective truth, but there must be an eternal source of the substance of the worlds which make up the environment of spirits and which afford the object of the mind's experience. What then, according to Swedenborg, is this environment?

We may think to find a pointer to the solution of the problem in what Swedenborg teaches of the extension of thought by vibration in spiritual atmospheres and that it is through such vibration that communication is effected between spirits. Thus we are distinctly told that

"All man's affection and derivative thought is not only within him and makes his life, but is also without him and makes the sphere of his life," Ap. E. 865. Again,

"All thoughts and affections enter into the spheres of the societies with which they are in agreement; hence there are extensions (of thought) like extensions of rays from objects in the world, which spread freely on every side." A. C. 6603.

Speaking with angelic spirits, "the affections and thoughts appeared like a stream around, extending in all directions, whence it is manifest that affections and thoughts thus extend themselves." A. C. 6606.

"When thoughts with affections diffuse themselves they circulate almost according to the forms of the circumvolutions of the cineritious substance of the human brain." A. C. 6607.

"When the thought of the angels falls to lower (spheres) it appears like a bright white cloud: but the thought of the angels who are in the higher heavens appears like a flaming light from which there is a vibration of resplendence. This bright white cloud and flaming light are nothing else than the innumerable things which are in their thought: when these things flow into the thought of the spirits who are beneath, they are presented as only one thing: the light and the resplendence flow into their thought: and the flaming into their affections and this flaming leads their ideas and joins them together." A. C. 6615.

We are here assured that the environing spheres being

composed of thought and affection radiating from the subjects do by no means appear as abstractions or as emptiness: they have the substantial appearance that is presented by clouds and resplendent atmospheres. They are spoken of, indeed, as penetrating the thoughts and affections of the subjects, but this does not take away the actual outward appearance of air, light and splendor. We may compare this to the impressions of forms of letters or of vocal utterances upon our senses, from which impressions the mind takes in what is their spiritual or mental content: but the external medium of visible or audible figure remains the same objective thing.

But this environment of thoughts and affections radiating from angels and spirits does not originate in the angels and spirits themselves any more than the light and heat of bodies originate in the bodies themselves. They are only reflected from these bodies and have their origin in a supreme source of all affections and all thoughts, and of all the objective and phenomenal heat and light and atmospheres of the world.

It is here that Swedenborg cuts loose entirely from the subjective and pragmatic idealism which would regard truth as in the making out of the individual experience, and the world-reality as that which is evolved only out of the individual experience.

This supreme source of substance, motion, heat and light and life Swedenborg tells us is the Divine. The divine presence in the spiritual world is objectively perceived as a sun: the Divine Truth there objectively appears as light, the Divine Love as heat and the Divine of Use—as the activity of heat and light in the atmospheres.

Thus we read:

“The light of heaven which is Divine Truth and the heat of heaven which is Divine Good, both proceed from the Lord as from a sun. From that origin are all the things which exist and appear in the heavens.

“That which proceeds from the Lord as a sun in heaven is called Divine Truth. Although in its essence it is Divine Good united to Divine Truth,—hence the angels have heat and light. (H. H. no. 117.)

"The Divine Good and the Divine Truth which are in the heavens from the Lord as a sun are not in the Lord but from the Lord: *in* the Lord there is only Divine Love which is the Esse from which the Divine Good and Truth of the heavens exists. . . . Since the Lord as a sun is Divine Love and the Divine Love is Divine Good itself, therefore the Divine which proceeds from Him and is his Divine in heaven is called for the sake of distinction Divine Truth; although it is Divine Good united with Divine Truth. This Divine Truth is what is called the 'Holy' proceeding from Him." (*ibid.*, no. 139.)

"The angels have an atmosphere in which the sound of their speech is articulated, but it is a spiritual atmosphere." (*n.* 235.)

"In the spiritual world there are atmospheres—since light and heat with their differences cannot exist without atmospheres. That there are spiritual atmospheres is evident from the appearances in the spiritual world of colors, of meteors, of clouds, thin and dense, of winds, of weight and pressure and thence of permanent endurance." (*J. n.* 312-314.)

"Each world, the spiritual and natural, consists and remains in existence from three atmospheres or elements: of which the first nearest the sun is called the aura; the second under this the ether, and the third, under these two, the air. These three atmospheres in the natural world are natural and in themselves passive; but the three which correspond to them in the spiritual world are spiritual and are in themselves active, because they proceed from a sun which is pure Love." *Cor.* 17.

Finally, as regards Swedenborg's teaching regarding spiritual environment, whether the environment of the Divine or of the individual spirit we have the important statements regarding the sphere exterior to and embodying both the spheres of love and of truth, namely, the sphere of use or work. This has its correspondent in the physical world in the third or actinic element of the sun's ray; and in the third or

aerial atmosphere which is the basis of all mineral forms and hence of all earthly evolution and growth.

For we are taught that: "there are three things in the Lord which are the Lord: the Divine of Love; the Divine of Wisdom, and the Divine of Use; and these three are presented outside of the spiritual sun, the Divine of use by the atmosphere. . . . The third thing which proceeds is the atmosphere, and this proceeds from that Divine of the Lord which is called use." D. L. W. 296.

"Love is the end, wisdom the instrumental cause, and use the effect, and use is the complex, containant and basis of love and wisdom." 213.

"Love has use for its end and produces use by means of wisdom; for love and wisdom without use have no boundary or limit, and, therefore, they cannot be said to *be* and *come forth* unless there is use *in* which they may be—these are as end, cause and effect." 320.

The Uses of all things are the very recipients of life and derivatively the forms of uses are. 66. "The end of all uses is to produce uses—and the beginning of them is the force acting from this endeavor. These are of the mineral kingdom. The uses of all created things ascend through degrees from ultimates to man and through man to God, the Creator, from whom they are." 65.

We are now furnished with Swedenborg's complete survey of what may be called human experience, whether in the state of man or spirit. We find that it consists of the recognition, first of all, of a world other to or outside of ourselves; this is the very basis of our consciousness, our knowing ourself together with the other than self. This first all-knowing faculties we must call the sense of the other, or the time and space faculty; for it is absolutely impossible for us to know ourselves, or to think without the intuitive sense of time and space. Hence the time-and-space *form* of thinking and of ourselves or to think without the intuitive sense of time and space. Hence the time—and—space *form* of thinking and of *seeing* things accompanies us everywhere as much in the spiritual world as in the physical world. Thus we read that

"in the Spiritual World the progressions of life appear to be in like manner progressions of time; for spirits live together as do men here, which would be impossible without the *appearance of time*; but time there is not distinguished into time as here." D. L. W. 73.

Also: that "distances and spaces exist with the angels altogether according to the states of their interiors; and therefore no notion or idea of space can enter their thoughts, although spaces with them are as real as they are in the world.

"And although there are spaces in heaven as in the world still nothing there is measured by spaces, but by states." H. 195:198.

Finally, as regards these appearances which are equally the "phenomena" of human experience in whatever world, we read that "the objects which appear before the eyes of the angels in heaven and which are perceived by their senses appear and are perceived in as lively a manner and, indeed, much more clearly, distinctly and perceptibly than those which on the earth appear to man. The appearances which exist from this origin in heaven are called real appearances because they really exist. There are also appearances which are not real because although they do indeed appear they do not correspond to the interiors." 175.

"Representations in heaven are *real* appearances because they exist from the light of heaven." A. C. 3485.

The Divine influx is turned into representations in the superior heavens and thence in the inferior heavens. Things which appear before the eyes of the angels in such forms as are in nature are called representative, and internal things are thus turned into external. A. C. 9577, 2987 to 3002.

We see then that Swedenborg is teaching a real and not a delusive or imaginative environment of man and further that this environment is not produced from the subject, but comes from a source above and distinct from the subject. It is produced not by *radiation* from the subject—but by reflexion from the subject of that which is radiated from a higher central source of all motion and of all substance. We are told

distinctly that the spirits' vision of things is "from a light of heaven," but "according to the state" of the viewer. The analogy with our knowledge of this world and of our environment is perfect, and so perfect that to deny the reality of the spiritual environments as a thing of angelic experience is really equivalent to denying the reality of our natural environment here as a thing of human experience. For what is it that we experience in both cases—but radiation from a center not ourselves, through media not ourselves, producing an effect known to ourselves as consciousness or sensation and there being thrown back or out again into the world carrying form, figure, color, meaning, quality—according to our state. The house that we see is really a stream of vibrations of ether coming to us from without, but mentally turned by us, according to our state, into a house as something seen outside of and apart from us. In this way every mind is a centre of a little universe—but a centre by reflexion, not by original radiation. If there were no "light from heaven" or in this world, its equivalent, "light from the sun," no working of our imagination would ever enable us to actually see the house as a reality outside of ourselves.

The next point of the analogy is this, that all that we know, whether of the radiating center or of the media, we know only in their effects, in their atmospheric pressure and motion around us. We strain our minds to see how we can see truth and good as streams of divine light and heat in the spiritual heavens, but we go on quite contented and unconcerned with seeing no heat and no light as such in our natural skies. The heat we do not see at all; at most we can feel it through the activities it stirs in the subtle atmosphere with which we can come in contact. It is precisely so with the presence of divine Good in the spiritual atmospheres. We cannot see it in itself, but we can feel it in the affections of love stirred within the soul and in the whole tendency of the universe to the production of uses and the delight of mutual service.

Besides this feeling of heat, which corresponds to man's perceptive faculty, there is a knowledge of heat through the light which it produces or in which it forms itself for vision—

namely, in the vibrations of the ether which we know as light; that even these vibrations of light are nothing to human experience except as they are reflected, that is, except in their effects on the plane of reaction. What we see then in our skies here are not light and heat, but the effects of light and heat upon the lower and grosser planes formed out of the material or mineral atmospheres; and equally in the spiritual world what we shall see in the heavens above us will not be truth and good in the abstract so to speak, but the effects of truth and good on the plane of the spirit's sensation, motion and action and as reflected, or as reacting according to the states of individual spirits.

The last problem to be touched upon by me in this endeavor to translate into human experience the whole objectivity of the spiritual world is that of the plane of contact itself. What do the inflowing or downflowing rays of spiritual heat and light actually touch as a plane from which to rebound in affecting the sensation of a spirit? The only answer I can give is that they touch the limbus or the outer sensitive enclosure and boundary of the spiritual body. What this body is, is held by some to be a matter of obscurity so far as defined by Swedenborg. It is without doubt something that the spirit derives from the natural world and that on which the spirit depends for his continued personality and individuality. I have treated of this according to the best of my ability in my address of last year on "Swedenborg's Doctrine of the Purer Parts of Nature." I will here in conclusion only offer as a hypothesis for the further developing of the subject the suggestion that the memory being the reservoir of all that which the spirit derives from nature through the experience of a physical body is itself this limbus, this sensitive encasement of the spiritual body, and especially—as mother of all other sensations and all other mental impressions and memories—the mental conceptions of Time and Space. All these things of natural experience, however brief and imperfect, go to make up that organism of vessels into and upon which may flow the rays of divine truth and good under the appearances of the heat, light and atmospheres—thus of a complete en-

vironment of a spiritual world. Out of much that might be quoted on this point, I will offer only this one passage in illustration if it cannot be called a corroboration of the idea I am suggesting.

In speaking of the letter of Holy Scripture as a "body investing a living soul," Swedenborg goes on to say: "Nevertheless the things belonging to the literal sense are like the things in the body of man, namely, like the knowledges pertaining to the memory which are derived from the things of sense and which form common vessels containing interior things. . . . The vessels are one thing: the essentials contained are another. The vessels are natural things: the essentials contained in the vessels are spiritual and heavenly." A. C. 1408.

To sum up in a sentence my argument and conclusion: we shall experience our environment in a spiritual world precisely as we experience our environments here, namely, as a reality, objective to our sense and perceptible to us not in its interior substance and form, but only in its effect in the world of uses.

No one is more aware than myself of the temptation presented in a study of this kind to substitute words for things and to hide in a veil of familiar phrases having but little practical meaning one's real inability to present definitions satisfactory to himself. I have endeavored as far as I could to avoid this kind of self-illusion. If my hearer or reader, however, thinks he finds a weak point in my analysis of the spirit's supposed experience of his spiritual environments, I can only beg him to test this supposed weakness by his own analysis of his own real knowledge of his environment in this world of matter. I will not say that we probably are capable of knowing little, but rather *are* capable of knowing in our experience as much of the one as of the other. And that knowledge, far from being an illusion, is the fundamental reality of all our consciousness and of our human intelligence.

FRANK SEWALL.

THE WORK IN SWEDEN.

To the Swedenborg Scientific Association:

Since reporting to the Association a year ago (*New Philosophy*, 1909, pp. 92-98), the investigation and publication of Swedenborgiana in Sweden has made such progress that I am able to report the following results with regard to the Stockholm edition of Swedenborg's scientific works under publication by the Royal Swedish Academy of Sciences. Vol. III. containing Swedenborg's "Prodromus Principiorum Rerum Naturalium" and the other works published at Amsterdam in 1721, together with a considerable number of treatises hitherto unpublished, is about to leave the press. The text of this volume occupies more pages than was the case in the preceding volumes, and the arrangement of the works in Vols. III. and IV. has again been altered, owing to the inclusion in the series of much new material, the publication of which was not originally contemplated. In order to explain clearly the nature of the alterations and examinations referred to, it will be best to review briefly the history of the edition.

As originally planned the edition was to include a number of Swedenborg's earliest works of the period 1716-1722. It was not intended to include the *PRINCIPIA* and the works on *IRON* and *COPPER*, but the works on the *BRAIN* were to follow immediately upon the early volumes. But the plan has been altered from time to time until now the number of volumes planned has been trebled. Without referring to the details I shall only mention the decision to include the three volumes of the *OPERA PHILOSOPHICA ET MINERALIA* and Swedenborg's anatomical and physiological works, and shall pass at once to a brief description of the changes introduced in Vols. I. to IV. These volumes will contain nearly everything Swedenborg produced before 1734, that is, practically all of his original scientific works prior to the *PRINCIPIA*. Most of the earliest works on geology and cosmology have been published in Vols.

I. and II., and Vol. III. contains the *PRODROMUS PRINCIPIORUM* and numerous smaller works. As for Vol. IV., it will contain the facsimile reproduction of the *DÆDALUS HYPERBOREUS*, one-half of which has been photographed, and a collection of miscellaneous papers and treatises, many of which are now accessible only in Vol. I. of the *Photolithographs*. During the past year I have been busy with these two volumes and also with the Introduction to Vol. III., which has necessitated much laborious investigation concerning "The Sources and Development of Swedenborg's Early Philosophy of Nature," the subject of the Introduction. Personally it has been a source of the greatest delight to me to see how Swedenborg's preparation for his future mission, from 1710 onwards, proceeded during the period prior to the "*Principia*," and especially from the time of his university studies until 1722, when he concluded his early investigations in physics, astronomy, chemistry and geology.

From the above statement with regard to the investigation and printing of the scientific works it will be seen that I have been devoting my best energies to the publication of Swedenborg's works, according to the message received from the Association last year, although I have also, as during the previous year, endeavored to do everything to fulfil our agreement with the London Swedenborg Society, involving the performances of certain uses which indeed are in the interest of the Association's central purpose, although to some extent of a temporary nature. I have, however, felt that it is of no small importance to strike while the iron's hot with regard to the subsidiary uses referred to, since their accomplishment needs attention now if they are to be attended to at all. I shall now refer briefly to the subsidiary uses with which progress has been made during the past year.

The three volumes of the *INDEX BIBLICUS* are now phototyped, and I am at work upon the titles and prefaces. It is clear that the phototyping of Swedenborg's unreproduced theological works should be continued, by the completion of the volume of miscellaneous theological works begun in 1903, a work in which the London Society is willing to co-operate with

the bodies to the New Church in America. The original MSS. of the *ARCANA CŒLESTIA* and *APOCALYPSIS EXPLICATA* should also be phototyped.

The Memorial Volume on Swedenborg has been largely drafted, but its publication will be postponed until after the celebrations this year of the centenary of the Swedenborg Society of London, and the bi-centenary of the Royal Scientific Society of Upsala. In preparation for these events I have spent part of my time in planning and printing a number of festival publications, including reproductions of a number of Swedenborg's earliest scientific works. Progress has also been made with the latter portion of Part II. of the Association's series of *SCIENTIFIC AND PHILOSOPHICAL TREATISES*, by Emanuel Swedenborg, and with the new edition of the *WORSHIP AND LOVE OF GOD*, and I have felt thankful, on account of much study during recent years of Swedenborg's philosophical and anatomical works by myself and Professor O. M. Ramstrom, of Upsala, that the publication of these works has been delayed, for it will now be possible to include certain features which will greatly increase the value of these new editions.

Before referring to the truly wonderful results obtained by the Professors of Anatomy at Upsala, Prof. J. W. Hultkrantz and Prof. O. M. Ramstrom, it will be best briefly to describe the course of events during the past year in connection with the present movement in Swedenborg's native land and in England, to honor his memory and to do justice to his gigantic and many-sided labors in science, philosophy and theology. The International Swedenborg Congress which is to meet at London early in July under the auspices of the Swedenborg Society will see assembled from various centres in Europe and America many students of Swedenborg's works representing all shades of opinion. Sweden will send to London, among other representatives, a number of scientists from Stockholm and Upsala who will lay before the Congress the results of the recent investigations of Swedenborg's earlier series of works which have been carried on at the Swedish centres of learning. It is difficult for anyone not on the spot and intimately ac-

quainted with the conditions obtaining here, to realize the remarkable character and extent of the movement which has developed in Sweden since 1902, and which has accomplished so much in reviving the study of Swedenborg's life and works. The Swedenborg Committees at Stockholm and Upsala are investigating and publishing Swedenborg's scientific works; arranging for the unveiling of the Swedenborg sarcophagus in Upsala cathedral in connection with the celebration next November of the bi-centenary of the Royal Scientific Society, of which Swedenborg was a founder and most active member; describing in detail Swedenborg's remains, including a full account of all information concerning his person and of portraits of Swedenborg, while the Northern Museum at Stockholm is continuing the collecting of all objects which throw light upon the life and works of Swedenborg and his nearest relatives. The Swedenborg Committee at Upsala in charge of the sarcophagus preparations has reported in favor of a handsome stone casket of red granite ornamented with a bronze medallion and an inscription: "EMANUEL SWEDENBORG, VATES SUECORUM."

The work of Prof. J. W. Hultkrantz, on Swedenborg's remains, with an appendix by the present writer on portraits of Swedenborg, will be published in the official "Acts" of the Royal Scientific Society of Upsala, and will contain a full historical discussion, including several new documents and a number of interesting illustrations. In addition to the five lectures previously delivered before the medical societies at Stockholm and Upsala Prof. Hultkrantz has recently delivered another lecture on his results before the Society "Idun" at Stockholm.

Prof. O. M. Ramstrom, who, in 1908, as Dean of the Faculty of Medicine at Upsala delivered the address to the graduates from that Faculty on "Swedenborg as a natural scientist and especially as a cerebral anatomist," has continued his researches and followed out in great detail the historical origins and development of Swedenborg's doctrine concerning the brain and nervous system, and produced a long paper on the subject which greatly modifies and extends previous conceptions, and

which will be laid before the Swedenborg Congress in London next July.

As the representative of the Association I again visited London last June as the guest of the Swedenborg Society, delivering an address at the annual meeting and also attending the meetings of the New Church Conference at Kearsley. As on my former visit, the liveliest interest was shown in the work in Sweden, and all plans were fully discussed with the Committee of the London Society, although no new work beyond that already referred to in my last annual report to the Association was undertaken.

Not until this year has the full story of Swedenborg's later years, especially his connection with the great controversy in the Gothenburg Consistory, been made accessible to New Church students. The important work of Mr. Wilhelm Berg, of Gothenburg, on the History of the Gothenburg Diocese during the 18th century so aroused my interest that I made three journeys to Gothenburg last autumn in order to investigate the original documents, the results being recorded in *NEW CHURCH LIFE* for January, and the complete analysis of all the evidence concerning this most important of religious trials since the great councils of the early Christian Church is now appearing in the *LIFE* from the pen of the Rev. C. Th. Odhner. This biographical material is beyond doubt the most important accession to our stores of knowledge which has come to light during recent years, and I take great pleasure in here acknowledging the source of the reference which first drew my attention to Berg's work, namely, Professor Hjalmar Holmquist's contribution in the Swedish periodical *KYRKLIIG TIDSKRIFT*. The contributions of Professor Holmquist and of other Swedish authors who have recently written concerning Swedenborg have been noticed in the April issue of the *NEW CHURCH QUARTERLY*.

Beyond calling attention to the various articles in New Church periodicals in which the results of researches on Swedenborgiana in Sweden have been described, there is nothing further to report concerning my activities as the representative of the Association abroad, except the reception from President

Sewall of the contributions from members and friends of the Association in payment of the wreath which was laid at the head of Swedenborg's casket in Upsala Cathedral on May 19th, 1908, on behalf of the Association and admirers of Swedenborg in North America. The numerous fading wreaths, many of them from England, still surround the silvery covered casket in the "Swedenborg Chapel," and recall to mind when the fading light of evening fills with mystic charm the vaults of the grand old cathedral that day when Svea received again her exiled son.

Hoping that the Association will have a successful meeting and that its important uses will continue to prosper, I remain,

Yours respectfully,

ALFRED H. STROH.

Library of the Royal Swedish Academy of Sciences, Stockholm, April 30th, 1910.

THE FIBRE.

TRANSLATED BY THE EDITOR.

CHAPTER VII.

(Continued.)

THE MEDULLARY SUBSTANCE IN GENERAL.

128. *The second place is held by arterial vessels, which, passing by the cortex and continually ramifying, betake themselves to the medullary body, and there commingle with genuine fibres.* These vessels are not indeed fibres, since they take their origin only from the heart; yet they can be distinguished from genuine fibres only with the greatest difficulty; for they are of almost the same dimension, pellucidity, and whiteness. But that they differ in nature and function, will be demonstrated in the following pages. That the carotid and vertebral arteries, mounting up from the kingdom of the heart, approach the cerebrum and enter into it, is sufficiently evident from anatomy; for they compactly insinuate themselves through the single fissures and into the well nigh labyrinthine anfractuositities, and, by their mutual apposition and conglomeration constitute membranes, or a kind of vascular flesh. In this way they frequently penetrate into the beds of the cortex, or, passing the cortex by, immerse themselves in the medullary lake, and this in such number that it may be doubted whether the medulla is not a mere continuation of the arterioles without the intervention of any new substance, that is, of any cortical substance. But that the little arterial twigs penetrate into the medullary nucleus, and become the second constituent of that nucleus,—and this without that rebirth which takes place when they go into new cortical spherules,—is a matter that ought to be decided by experience alone. Let us therefore hear the anatomists:

MALPIGHI confirms it in the following words: "In the mass

of the cerebrum and cerebellum we found remarkable and numerous ramifications of arteries and veins,—such certainly as are to be met with nowhere else in the body; yet in such a way that the trunks of the arteries were not always accompanied by veins; this we have especially observed in fishes. In the more perfect animals, therefore, it is clear that the blood-vessels, by means of the meningeal membranes, irrigate the extreme glands of the cortex, of which the cerebral gyres are composed, and that their offshoots penetrate to the inmost parts of these cortical glands." (n. 20.) "Nor are there wanting blood vessels, by which, indeed, the whole substance of the cerebrum is pervaded; for if we institute a comparison with the whole body, we shall find at least a third, if not a half, of the blood is carried into the head." (n. 21 *sup.* Trans. II., n. 78.)

LEEUVENHOEK: "Throughout this clear matter, and these globules were scattered a great number of extremely minute blood vessels, which, when laid over each other three or four deep, without any other interjacent material, were likewise distinguished by their red color," etc. (n. 22; Trans. II., 71.) "Examining a sheep's brain, I likewise found in the cortical parts a vast number of the most delicate blood vessels. I have often seen this incomprehensible multitude of exquisitely minute blood vessels with my own eyes; and I saw almost every single vessel again splitting into lesser branches," etc. (n. 24; Trans. II., n. 73.) "When we gently separate the deeper parts of the cortex, lying in the middle region of the cerebrum, from the medullary parts, we see between them so great a number of little blood vessels, as to make an entire membrane. In addition to these fine blood vessels, there are, in the cerebrum, still other vessels of such fineness, that, in my judgment, no round corpuscle could permeate them, even if it were divided into more than a thousand parts. I say nothing here about blood vessels which equal or excel the thickness of a hair of our head." (n. 22.) "In all my observations, enumerated in these pages, I pass by without mention the innumerable blood vessels running

through the cerebrum, which can be seen in the dissected brain with the naked eye; for they are like entire rivers when compared with the little vessels spoken of above, which latter must be esteemed as the merest rivulets, brooks, and rills." (n. 25.) "When I set the structure of a pig's brain before my eyes, I had no difficulty in concluding that there must be a certain connection between the blood vessels and the particles of the brain, in order that the latter may be preserved, and may maintain their vitality by a perpetual inflow of blood; for in the bodies of animals where this is lacking, corruption must necessarily set in." (n. 36.) Consult the author's figure, [*sup.*, n. 38, fig. 13], where he delineates a blood vessel lying in the midst of the cerebrum, which he thus describes: "I placed under the microscope an extremely fine particle of the cerebrum, in which appeared an incredible multitude of blood vessels cut transversely and at right angles; indeed, all the parts designated in Fig. 13 by the letters OPRSTVW, even to the very dots, are nothing but blood vessels. Y and Z designate two larger vessels, containing clotted blood." (n. 38.)

The stupenduous ramifications of the arteries of the cerebrum, their discription, and their consequent abundance, are depicted in a figure by Ruysch, who, by his peculiar method of maceration,* separated and unravelled the little stems which are continuations of the arteries, by loosening their connections, and thus brought to view the immense multitude of vessels penetrating the cerebrum. ([n. 53-55], Trans. II., n. 87.) This anatomist gives reason to believe that the cortical substance is not glandular but vascular. (n. 57; Trans. II., n. 86). But this dispute about words is easily settled if we reflect on the origin of the cortex, and on its progress into the fibre; for each single spherule, vesicle, or gland of the cortex arises from a certain vascular termination, and from this it progresses into a fibre. The fibre, therefore, is a continuation of the vessel, with the cortex interposed. Confer, Trans.

*For a description of this method, see E. A. K., II., n. 86.

II., n. 110, III, *seq.* Thus there is nothing in the cortical gland that is not vascular, according to the opinion of Ruysch, and there is nothing in this vascular expanse which is not glandular, according to the opinion of Malpighi, who says: "This is undoubtedly true, namely, that every single gland of the cortex is bedewed from the extreme ends of both arteries and veins." [n. 20.] Confer, [n. 19, 20, 23, 24, 25, 45, 57, and] Trans. II., n. 12 [72], 73, 74, 76, 78, 80, 85, 86, 91, III-III6.

The above considerations make clear the distinction between fibres and vessels. The former, although they are continuations of arteries, with the cortex interposed, greatly differ from vessels in their nature, that is to say, in their force, and their manner of action; for from a new origin, they derive a new genius,—on which matter see what follows. By vessels, therefore, we mean, not only the arterial shoots implanted in the cortex, or which build up the cortex, but also those which, passing the cortex by, pour themselves into the medullary nucleus. In this way, I believe, one may understand what the fibre is; and what the vessel, and, moreover, that in the structure of the medullary part of the cerebrum there is more of what is vascular than of what is fibrous. For the vessels are continually ramified, and thus occupy a great deal of space; but this is not the case with the fibres, for these cannot be ramified. This seems to have given the ancient philosophers, such as [Aristotle], Alexander, Averroes, and Apono,* the basis for their opinion that the nerve fibres arise from the heart; and it seems also to have given Praxagoras,

*The Alexander referred to is probably ALEXANDER OF TRALES (525-605), a Byzantine physician who is said to have been the greatest of medical authors since Hippocrates. AVERROES (1126-1198), was a Spanish philosopher and physician, reckoned as the most advanced Aristotelian of his age. APONO (1250-1316), was an Italian physician and Aristote-

lian, celebrated as a translator of Hippocrates and Galen. In introducing these authors, and also those that follow in the text, Swedenborg is quoting from Baglivi, who states that, while Alexander, Averroes and Apono agreed with Aristotle that the nerves arose from the heart, they added that this origin was by means of the brain. See n. 12.

and, among modern authors, Cesalpin, Reusner, Hoffman, Martian, and also Willis, the basis for their opinion that the nerves are nothing else than continued veins and arteries, (n. 12.)

ARISTOTLE'S words are: "In all blood animals, the principality of the senses is in the heart, for in the heart must we necessarily place the common sensory of all the sensories." (*De Juventute et Senectute* iii., 23.) "Some suppose that the power of sensation has its seat in the cerebrum." (*Ibid.*, 35.) "Therefore, in blood creatures, the soul, as it were, fiery, is in the heart, and in bloodless creatures, in some corresponding part." (*Ibid.*, iv, 14.) "For, in animate creatures possessed of blood, the heart is what is first begotten; this is evident from the things which we have seen in such creatures, while they were still coming into being. (*Ibid.*, iii., 7.)

But in that age, when experience was slight, being, as it were, in its infancy or cradle, it does not seem to have been known that the cerebrum exists before the heart, or that, first of all, are produced fibrils, then vessels of the purer blood, and lastly vessels of the red blood; and that the one precedes the other, and then, as they are compounded, acts with it. See Trans. I., Chap. 3. [n. 241, *seq.*, especially n. 249, 270-278.] Nor does it seem to have been known that from the abundant corcular substance of the brains proceed fibres, which furnish natal gifts, not only to the heart, but also to all the other members of its kingdom, and this, in a manner ordained, in order that vessels may return to their parent cortex, and may apply themselves therein that thus the circle of life may be completed. Therefore fibres descend from the superior region of the kingdom into the inferior region, or into the body; but vessels ascend from the inferior region, or from the kingdom of the heart, to the superior region; and both are united in the cortex. The cortex, therefore, looks both backwards and forwards, that is to say, to the vessels that approach, and to the vessels that depart; thus in the effect it regards the cause, and in the cause, the effect. But, as these matters are somewhat remote from

the senses, and are therefore still slightly obscure, I shall endeavor, in the following pages, to render them more clear, and to explain them.

129. *There are also vessels of a middle nature, or vessels emulous of the fibre, which are taken from the tunics of the arteries and from the pia meninx, and are inserted among genuine vessels and fibres, in order that they may perform their own particular function.* See above, n. 123. That stems, as it were vascular or fibrous, are taken from the tunics of the arteries, and also from the pia meninx, seems to have been first detected by the glasses of Leeuwenhoek. This anatomist calls them fibrils,—but it is better to quote his whole description. Consult figs. 8, 9, 10, 11, 12 [see above, n. 36-38]. “In fig. 8, ABCDEFGHIK designates an extremely minute portion of a pig’s brain,—the particle BCDEF lying quite close to the meninx, AB, KC, ID, HE and GF, designate blood vessels which, immersing themselves more deeply into the cerebrum, escaped the sight; for the few and scattered blood globules which flow through them have not enough redness to make the vessels visible. These particles that are interjected lengthwise between the blood vessels, and are, as it were, continued from them, we have rightly called fibrils of the cerebrum. These fibrils which have hitherto escaped my sight, are shown as cut, not straight across, but obliquely. In the same figure, ML denotes the ruptured particles of the above mentioned fibril.” (n. 36.)

“In Fig. 9 the letters NOPQRS denote only a very small part of what we saw through the microscope; and it is delineated merely to exhibit to the reader the membrane, PQR, which covers the cerebrum. The artery, NQ, seen in the middle of the figure, to which, on both sides, are joined fibrils of the cerebrum, is much thicker in the middle than at the extremities N or Q. The reason is, because the fibrils seen between NOP and NSR have so contracted or shrunk, that they have torn the artery; the middle portion of the latter, therefore, bulging to both sides, is necessarily thicker. Moreover, I placed under the microscope a minute portion of these fibrils

of the cerebrum of which I had happily succeeded in making a longitudinal section. They are shown in fig. 10, by ABCDEF. These fibrils exhibit to the sight four of their sides; indeed at one time I saw a fibril furnished with six sides. Hence follows the conclusion that one fibril consists of a number of fibrils. These fibrils shown in the figure were not taken from the neighborhood of the meninges, but from about the very centre of the cerebrum, and they consist of such minute particles, that you cannot recognize any shape in them. These cerebral fibres are, I suppose, covered with delicate little membranes, which because of their extreme minuteness never bare themselves to our sight. But unless we suppose their existence, how can we account for the separation or distinction between the fibrils which our eyes behold? This minute portion of the cerebrum was so shrunk that in two places, BG and BH, the cerebral fibrils were ruptured. I therefore conjecture that those fibrils had been connected with each other by little membranes. A second rupture of the fibrils is seen in the same figure at IK and IL, where we see fibrils connected with the fibril I, and, above KL, with other fibrils also. What we see in the neighborhood of A and F are particles which lie enclosed in the cerebral fibrils and which have been laid bare by the scalpel, or by the incisions of the scalpel. When we see the fibrils of the cerebrum disposed in this manner, and when, at the same time, we contemplate the fibrils shown in Figs. 8 and 9, we must consider it as established that the blood vessels delineated in these figures were cut lengthwise exactly along the line of their channel, and that the cerebral fibrils were cut across obliquely, so that to our eyes the latter appear incomplete. If now we reflect on the softness of the particles of which the cerebrum is contextured, and on the necessarily fragile nature of the parts that clothe the cerebral fibrils, we can readily imagine how that those parts would never become visible to human eyes. But the above mentioned fibrils of the cerebrum, though conjoined with blood vessels in the manner just mentioned, and receiving from them their increase and

nourishment, are yet by no means offshoots of these vessels, for I hold that these fibrils are not posterior in origin to vessels" (n. 37).

"When I again secured the brain of a pig, I at once removed the investing membrane, and placed some parts of the cerebrum under the microscope. Examining them with the closest attention, I found fibrils of the cerebrum contiguous to the meninx; but, as far as I was able to distinguish by sight, they showed a preference for the round rather than the quadrangular figure. I have often made longitudinal sections of the fibrils of the cerebrum where they are adjacent to the meninx, and, finally, I was fortunate enough to successfully place them so dissected under the microscope without a break. I at once had them drawn, and they are shown in fig. 11, by ABCDEF, CDE denoting the membrane investing the cerebrum. Where these cerebral fibrils are stretched lengthwise, they are rendered uneven by a number of rugosities, which the artist has imitated as accurately as he was able. The gap between A and D is caused solely by this corrugation, whereby some of the fibrils are drawn apart from each other. I afterwards tried to so separate the fibrils of the cerebrum from each other as to see both their thickness and breadth; but, in the process, they were, in part, broken into minute fragments. I placed the largest of these fragments, although it also was broken, under a higher powered microscope, and, in fig. 12, I have had it designated by GHIKLMN. The rupture of this portion is seen in two places, namely, HI and KL. The blackish color, marked MN, denotes the thickness of the fibril. As regards the flexures seen in the same place, I am unable to say whether it was I who made them, or whether they were caused by the pressure of adjacent parts. I take it that these fibrils of the cerebrum are easily four times thicker than the flesh fibrils of the ox" (n. 38).

Concerning vessels of stupendous fineness, which were detected in the cerebrum, see Leeuwenhoek's entire description, n. 22 above: and concerning the two kinds of fibrils, see n. 26.

As regards fibrils of a middle nature, they do not seem to have appeared as simple fibrils, but as fibrile somewhat compounded and confasciculated, not unlike the chords of Willis in the sinus of the falx, whose roots are drawn from the interior tunic of the sinus [see n. 2]. So also the above mentioned fibrils, which, however, are drawn from the exterior tunic of the artery. But what is the nature of these fibrils will be better gathered from a description of their function.

130. *There are also little ducts, though few in the healthy brain, which are produced from glands that frequently come into existence, and which take on the appearance of a compound fibre.* As to what vessels are called ducts, see above 119, namely, such as proceed from glands and carry a humor other than blood. Glands of the kind from which these ducts are extended ought not to be confounded with cortical glands, for they are of a different genus, order, and nature. The cortical glands are produced from vessels of a middle nature, but these are produced from true vessels. The former are natural, for without them from true vessels. The former are natural, for without them there would be no brain, but the latter are exceptional, nor are they seen except in a brain that is diseased and whose vigor has been weakened. For as soon as the contiguity of the parts, and the ratio of the just tension, begins to be deficient in any of the recesses; or as soon as the medulla begins to gape with undue fissures, some glandular corpuscle is immediately interposed which not only fills in the space, but also restores tone and situation to the other threads, and at the same time absorbs noxious humors and carries them off through ductules. Such glandular excrescences are found in the fabric of the sinuses of the dura mater, and even outside the sinuses between the meninges, and also in the pia meninx itself, and in the choroid plexus and elsewhere, as has been frequently discovered in the body when laboring under such sickness. But they are rarely found except in brains weakened by old age, or relaxed, and, as to their interior connections, dissolved by [cerebral] dropsy. Without these helps to support their feebleness, such brains, wholly impotent of

action, would soon waste away, or die. It is my belief that it is glands of this kind that LEEUWENHOEK mentions, where he says: "I attentively examined with eyes and mind, the white or medullary parts of the cerebrum, and especially those that tend towards the beginning of the dorsal medulla, and, as I judge, I there found what appeared to the eyes to be oily globules, large and translucent, as it were surrounded by, or lying in, an ineffable multitude of the most delicate little retiform vessels or lines, mingled with a number of coarser vessels; which latter took a straight course, and were remarkable for their pellucidity" (n. 24). "Having turned my attention to the globules in the medullary part of the cerebrum, I began to consider as to whether the minute blood vessels emerging from the cortical parts of the cerebrum are not again dispersed into fine twigs of the same kind; and whether many of these twigs do not, as it were, embrace these globules or yield to the globules. This my opinion,—that many of the irregular globules were surrounded by vessels,—was strengthened when I saw that many of the above mentioned vessels were clear in the middle, and carried at both sides a somewhat darkish appearance; and still more when I found, lying in the ruptured globules, many fine fibrous parts, which, as far as appears, are vessels" (n. 23).

But because glands of this kind are not met with except in brains wasted by some disease, I again warn the reader that he must be careful not to assume for such glands the genuine cortical glands which are immersed in the medullary part of the cerebrum and in its indrawn recesses in great abundance; nor can the sight distinguish between them, any better than between fibres and vessels. And yet an immense and intrinsic difference obtains between them; for the greater the abundance of the cortical glands, the healthier is the state of the brains; but the greater the abundance of glands of this kind, the weaker in health, and the more oppressed are the brains. These glands of the cerebrum should therefore be denominated false glands, and their ducts spurious fibres. How prone and ready nature is to fabricate such glandular structures, and thereby to restore things that are fallen and that are about to

fall,—and this especially in the body—is sufficiently evident from anatomy. But to proceed, *that there are so many kinds of little canals and filaments in the medullary structure of the cerebrum, cerebellum, medulla oblongata and medulla spinalis, is declared by the evidence of sight.*

131. *These threads, diverse in origin, nature, and function, mutually consociate and distinctly enfold themselves into reticular plexuses.* On the nature of the vessel as compared with that of the fibre and on the function of both, and also on vessels emulous of the fibre, we shall speak in the following pages [chaps. VIII. and IX.]. The present is merely preliminary, namely, that fibres, mutually consociated with vessels, go off into mere plexuses like networks, the smaller within the larger; and that the medullary structure itself is a series and concatenation of such plexuses. From the determination of the fibres it is evident that each single fibre, whencesoever derived, is eagerly bent after the performance of its own particular function in the body; and therefore the fibres decussate neighboring fibres and those that they meet; they ride over them, embrace them in anastomosis, desert them, and again touch them and inosculate.

On this subject VIEUSSENS speaks as follows: "The medullary substance may be easily divided into those innumerable fibrils of the mutual connections whereof it is made up," and "it consists of somewhat long fibrils, variously inflected, which are so infolded in each other, and so intercommunicant, that they produce the appearance, as it were, of a spongy body" (n. 17).

And MALPIGHI: "The fibres of the cerebrum are long drawn out. They are not parallel, but repeatedly meet each other; and we see them gathered together into a fascicle, then again separated, and afterward riding over other lateral fibres, so that they present the appearance of a loose network. This is best observed in the shark or dogfish" (n. 21). "For it is nature's accustomed way, especially at the ends of vessels, to form a network, as we find is the case in the extreme ramifications of arteries and veins; and, if we may add confirmation from an analogous example in plants, there are not wanting

exactly similar structures in the fibres that compose the bark of the vine, and of other trees and plants, etc." (n. 20).

And LEEUWENHOEK: "When looking at the medullary parts of the cerebrum it often appeared to me as if I were looking at a fishing net, the threads or cords of which could be easily stretched; and that between each aperture of the net there lay a somewhat flexible piliform body" (n. 23). "I noticed fibrils which were joined together at one point, and then, at another, diverged from each other, and a litt'e later again united; and if I remember right I have observed similar conjunctions in the muscles of a heart taken from a certain animal. In order to make this clear as far as possible, I have had delineated an extremely minute particle of the cerebrum as seen under the microscope. It is shown in fig. 14 by ABCDEF, where CD are fibrils of the cerebrum, disjoined from each other, then coming together, and again diverging, but once more returning to the union at I, and still again at H. I have observed these alternations of conjunction and secession also in other places. Moreover, I placed under the microscope a ruptured particle of a cerebrum, designated by KLMNOPQR in fig. 15, where we see two fibrils digressing from each other at the letter N, and at once associating with other fibrils. Such consociations of fibrils can also be seen in other fibres." (n. 40.)

When this medullary structure is laid out or unfolded into a plane or membrane, nets like those of the fowler come manifestly to view; as is the case in the membrane that lines the roof of the ventricles, and also in the corpus callosum, and in the pia meninx itself, and elsewhere. These networks, of which the cerebral medulla is contextured, appear girt about with the softest little membranes,—perhaps, lest the humor running through the intercepted spaces lacerate the subtle plexiform texture, and a grosser liquor penetrate its interiors with ungrateful matters. But let us now to the use.

132. *Whence arises a structure, loose, spongy, pervious to lymphs, bibulous, soft, capable of expansion, free to act, and suitable for building up the nerves.* But let us take these characteristics one by one. It must be *loose* and *spongy*, since it

is a perpetual network, woven of the finest little stamens, or a plexus in a plexus; by virtue whereof it suffers itself,—not unlike a woollen, downy, or spongy substance,—to be compressed into the smallest mass. This also actually happens in the brains, for almost the entire medulla of the cerebrum, and also of the cerebellum, is compressed into a peduncle; which would never be the case, unless its structure were loose like a sponge, and, in the meantime, were steeped with humor. *Per-vious to lymphs.* There are also yawning spaces between each plexiform figure, which can be expanded and constricted in diverse ways, as may be gathered from Leeuwenhoek's figure described just above. That these little spaces communicate with each other, and that together they tend towards exits provided by nature, where they may lay down their phlegms, cannot, I think, be doubted; for a humor is perpetually passing through them, which is purer and more refined towards the origins of the nerves, but grosser and more feculant at the mamillary processes, etc. Hence it follows that such texture is *bibulous* and *soft*. Also that it is *capable of expansion*; for the little spaces are so many, as it were, least ventricles, hollows, or potencies of dilation and constriction. And, therefore, since there are so many ventricular fissures or yawning commissures, there is nothing to prevent the medulla being expanded both in particular, and also in general, and breadth-wise and also lengthwise. In this and in no other way, as we have frequently pointed out above, could it be formed in motion and for motion. Now since the whole medullary mass is expanded at every alternation of the brain's animation, it follows that at each such expansion it sucks in, transmits, and expels new juices. *Free to act.* For howsoever the form of the motion in the brain is varied, as, for instance, whether the force of its expansion be determined towards the interiors, or the exteriors, or in some other direction, still a mass that is so configured will yield in whatsoever direction it pleases, and will accommodate itself to every mode without danger of disruption. Meanwhile, in natural subjects, the criterion of freedom consists in this, namely, that the parts in their compound, approach more nearly to the nature of a fluid, and that they

are set more loosely or sparsely. For the compound or general is then left to the freedom of its simples or parts, entirely according to the nature of the action of these simples or parts. It would be otherwise if the parts or simples were more closely connected together, as is the case in the peduncles and nerves. For there fibre is bound and, as it were, chained to fibre, and they are held together by coverings or membranous bonds, and thus obligated to some particular mode of action. It is otherwise in the brain, and this is the reason why the first stamens are so soft as to be almost fluid, as in the embryo and infant; and why, in process of time, they acquire a harder consistency, which is the same thing as growing old. *And suitable for building up the nerves.* For in the nerves it is forced and confined to some particular form of action; not so, however, in the brains, from which it inflows through the nerves into the motor fibres, or into the actions designated by the brains; for the cause must be free to act, in order that the effect may go forth. Moreover, unless the medullary substance, which is continued into the nerve substance, were everywhere patulous, porous, and filled with little cavities, the spirits could never run through it, nor the other liquors transpire; and thus the nerve, deprived of its vital juice and incapable of action, would most certainly fail in the extremes, and thereby the correspondence of the extremes [with the beginnings], and the commerce of brain and body, and also obedience would be destroyed. *But that these things may be treated of distinctly they must be taken each by itself.*

CHAPTER VIII.

ON THE NATURE OF THE VESSEL AS COMPARED
WITH THE NATURE OF THE FIBRE, AND ON
THE FUNCTIONS OF EACH.

133. *From the cortex we learn the nature of the fibre, and from the fibre the nature of the cortex. For the fibre derives its origin, nature or force and mode of action, essence, form, in a word, all its state and genius from the cortex; since the fibre is a production of the cortex, that is, its elongated appendix.* The cortex does not beget and bring forth the fibre as a parent begets and brings forth some new offspring, but it produces itself into the fibre; for, separated from the fibre, the cortex, howsoever great its potency, is an ens without any determination in act, like a brain torn away from its body. That both together constitute a unanimous body is known from the fact that the cortex sensates whatever touches and strikes the fibre, and that the fibre does whatever the cortex determines. For the cortical substance is the real brain, or the common sensory and motory.

134. *Likewise from the heart we learn the nature of the blood vessel, especially of the arterial vessel, and from its vessels the nature of the heart.* This you will see confirmed everywhere in our First Transaction on the Blood and its Heart and Vessels.

135. *And because each spherule of the cortex is like a heart, see Trans. II., n. 132-139, and elsewhere throughout, and consequently each fibre is like an artery, therefore, from the heart we also learn what is the nature of the cortex, and from the artery what the nature of the fibre.* By this syllogism or series of consequences, we conclude with certainty that the indications afforded by the one member when theoretically examined, will lead us to the knowledge of the other; as in the present case an examination of the heart into a knowledge of the cortex; for there is a connexion of all things from their causes, which are simple and single.

The primitive little heart of the body, as is plainly seen in chicks and embryos, is not unlike a spherule and form such as is that of the cortical substance in the brain. The fact that the little heart of the body increases to its dimensions and amplitude, does not prevent the likeness of the one still remaining in the other. The mass into which the heart of the body grows must in all respects correspond to the extension of its action or circulation, and to the gravity of a grosser fluid, that is, to the resistance of the blood; for nature is perpetual in her measures and modes.

136. *And if anything be lacking, we are instructed concerning the nature of both from their forms, forces, and modes of action in the extremities; that is, from the universal anatomy of the body and the pathology and physiology of both body and animus.* There is not a single thing in the animate body that is not compounded and formed from a first and simple stem; for effects flow from efficient causes, while the modes of action in the effects are the phenomena with which animal pathology and physiology abounds. If now the efficiencies of things in the living system reside in the cortex, it follows that all the single effects conspire to reveal the nature of the cortex. This is also confirmed by the doctrine of order and degrees, which shows that aggregate entities of any given degree and series, refer themselves to their unities as to their most simple parts, (Trans. I., n. 629, 630), and that from the form, nature, and mode of action of such aggregate, we may know what is the form, nature, and mode of action of the parts, and therefore that a general and particular experimental knowledge of the things which at any time touch a sensory, points out the essence of the least things of the same degree, (*ibid.* n. 631); yea, of corresponding things which are still more simple, or, of superior degrees, (*ibid.* n. 632). But let us come now to a closer comparison such as you will see commenced in Trans. I., n. 472, 570.

137. *A comparison therefore teaches us: that since an artery is the continuation of a vein with the heart interposed, therefore a fibre is a continuation of a vessel of the brain with*

the cortex interposed. Concerning the artery see Transaction I., n. 130-133, and Ch. VII., on the Motion of the Adult Heart, [*ibid* n. 460 *seq.*]. For both vena cavae flow with their blood into the right auricle and ventricle of the heart, and when this blood has been passed through the lungs, it returns into the left heart. The right heart therefore is the venous heart and the left the arterial heart. But in the embryo, where the pulmonary tubes have not yet been opened, the venous blood is transferred by a quicker path, namely, by the foramen ovale and the ductus arteriosus into the left heart and the aorta. Thus the artery is wholly continued to the vein, with the heart interposed. I do not here dwell on the reasons why the continuation of vein into artery is closer and, as it were, more immediate in the embryo than in the adult, for in the latter, the blood is forced through the lungs, which are the two appendices of the heart, before it is returned towards the left or arterial heart. Now as regards the parts of the cortex: that they are continued from vessels or arteries, that is, that they are set in the last term of the arteries and the first of the fibres, has been shown in Trans. II., chap. II., [n. 69 *seq.*], and also confirmed by the most indefatigable and skillful anatomists, Malpighi, Ruysch, Vieussens, Ridley, Boerhaave and Leeuwenhoek, the proofs of whose experience, if I should again recite them, would fill both sides of the page. It is a constant truth that the vessel emanating from the heart, comes to an end in the cortex, and that by means of the cortex it is reborn as a fibre, which returns to the heart or to some vein or artery thereof, from which, by a wonderful gyre, it again rises up to the cortex. *Thus, as the vein by means of the heart, is reborn an artery, so the vessel, by means of the cortex, is reborn a fibre.*

138. *As the vein, when reborn an artery, entirely changes its nature, so likewise does the vessel of the brain when reborn a fibre.* That the texture of the tunic of veins is different from that of the tunic of arteries, and also the nature of venous blood from that of arterial blood, is sufficiently evident from the teaching of angiology;—but here is not the place to explain this difference. We note merely that as the venous blood differs

from the arterial blood, so the tunic of the vein differs from the tunic of the artery; for the one is so accommodated to the other that the tunic together with the blood constitutes the vessel. As regards the blood, it undergoes a change not only in the lungs but also in the heart; for the heart is a chemical organ preparing liquids for the composition of blood, (Trans. I., n. 453-457), for which end it also adjoins to itself the lungs, which are the appendices of the heart, as an aid. Hence also comes the transformation of the nature of the vessels. That it is form that makes things to be as they are found to be, see Transaction II., n. 244. As regards the cortex, it is not indeed the sight but the mind that, by comparison with the visible heart, comprehends that something similar can be predicated of the cortex, and also how far we may be allowed to carry the conjecture, (see Trans. II., n. 138).

139. *Hence, as the vein in respect to the artery is passive, and the artery in respect to the vein active, so the vessel in respect to the fibre, and the fibre to the vessel.* The vein can hardly be called passive in the sense that it possesses no activity whatever; for it is furnished with a muscular tunic, and it reacts so far as the blood which it pushes and propels toward the auricle of the heart acts (Trans. I., n. 190-198, 523); but the proximate cause of its action is due to the artery, (*ibid.*, n. 332.) Wherefore vein and artery proceed like two consorts of one marriage bed. So likewise the blood vessel of the brain, which, in itself, is quite active, but in respect to the fibre is passive. For all things in nature are relative, whence come measures, differences, degrees, and moments. *And because veins and arteries undergo this mutation by the mediation of the heart, so vessels and fibres undergo mutation by the mediation of the cortex.*

140. *But as soon as the artery of the body enters the threshold of the brain, that is, into the cranium, it frees itself from the empire of the heart and subjects itself to that of the brain; and hence it transcribes its active nature into a certain passive nature. By reason of this the arterial vessel of the brain, again become like a vein, is rendered passive in respect to the fibre, which is most highly active.* In Trans-

action II., n. 12-23, it was shown that as soon as the carotid artery touches the threshold of the cranium and becomes the internal carotid, it puts off its active and muscular tunic and superinduces a new tunic over that inmost one, which it still retains. It was also shown that by angular flexures and repeated gyres, both in the bone itself and also below the clinoid processes, it frees itself from the empire of the heart to which it has hitherto been subject, and places itself under the will of the brain; likewise also the vertebral artery, to say nothing of the veins and sinuses of the dura mater. Again, it was shown that it is the cortical and cineritious substance which is expanded and constricted, or is that from which the brain animates (Trans. II., n. 132); and that when these substances are expanded, the whole mass of the brain with all its blood vessels and all its medulla is constricted, and vice versa, (*ibid.*, 141); and hence that the systole and diastole of the arteries, so called, of the brain, no longer depends on the heart, but on the brain, that is, on its cortical substance. By reason of this the vessels of the brain are passive or obsequious to the cortical substances and their fibres, wherein the active force of the kingdom principally resides. With what art this arrangement is prepared, will be seen sketched out in the following chapter. For the present, it is a constant rule of nature that passive entities must be copulated with active in order that there may be a marriage, from which an offspring may be brought forth.

(*To be continued.*)

THE SENSES.

TRANSLATED BY E. S. PRICE, M. A.

CHAP. VII. (*Continued.*)495. 2. *The case is the same with imaginative sensation.*

1. For this disposes visual images into another order; they are then called ideas, and indeed material ones; 2. these also are natural, so far as the sensory ideas are natural, for they derive their origins thence. 3. But there must be an influx into these from what is superior, that they may appear truly harmonious, either from the understanding or from the superior mind. 4. Thence they derive the habit of truth or harmony. 5. From harmony we judge naturally of goodness. 6. But superior and inferior goodnesses rarely agree; but for the most part they contend; 7. hence are fallacies, unless truths of the higher faculty instruct, and its goodnesses at the same time flow in.

496. 3. *All truths still more superior, or those of the understanding, are not natural, but are adscititious, and artificial.*

1. For they are learned through the experiences of the senses and through sciences; 2. as for instance, concluding causes from effects, in physics, in morals, and in other things, or concluding consequences from premises, ends from means, things to come from things present and past. 3. All those things follow from doctrines; for they are collected from those things which, by means of the external senses, and by means of the ideas of the imagination, flow in beneath, thus from the inferior. 4. Thence those truth are truths so far as they coincide. Thence are our principles which are conjectures; 5. ideas, not truths.

497. 4. *There are nevertheless intellectual truths, which affect naturally.* 2. Those, namely, which all approve, as it were, with one mouth, 3. or those which fall under common sense, 4. and there cannot be anything doubtful in them, unless the nature of the mind be perverse, 5. or unless the order

of the superior faculty be perverse, 6. and unless it has respect to some good to which it deflects those truths and thus perverts them. 7. But these are very general ideas, in which the particulars are not distinct; but still the superior mind commonly acknowledges their form as harmonious. 8. Such are many moral truths, as, for instance, those of honesty, then certain very general truths of philosophy, and metaphysics. 9. The truer those principles are, and the better the connection by which they are reduced into a form, and the more agreeable it is to the nature of things, the more perfect are these truths, or, as I may so say, the truer. 10. Since Geometry consists of naked truths, therefore all things resultant from that science are truths. 11. So also are those things which can be truly deduced according to geometrical principles.

498. 5. *Those indubitable truths are only parts, from which superior truths are to be concluded.* 1. Thus the most general truths taken together again constitute a form; 2. then they can take on the form of what is true or what is false, altogether according to the ends of some goodness, which ends we propose to ourselves. 3. Those ends have respect to some love inferior or superior, 4. that is to say, either of the body as pleasure in effect, or delight of the animus, or pleasure in cause, or some love of self, or pleasure in principles. 5. The affection of truths is such as is the love which is proposed as an end. 6. All those truths are regarded as means, 7. and thus those ends are repugnant, then abhorrent, or, by a sinister explanation or a perverse connection, they are so formed that they may coincide. 8. The truths themselves, from which is the compound truth or conclusion, are regarded as the means of forming those things which they bring to those ends. 9. Hence dispositions are so far perverse that they do not deny truths, but they deduce thence, by means of perverse syllogisms, what favors themselves. 10. Wherefore those truths affect according to the loves, 11. which are natural, inferior and superior. 12. They affect indirectly or directly; 13. indirectly, if from concluded truths I wish to gain either fame or advantage. 14. This affection arises *through reflection*; 15. but indeed if anything is thence concluded which

as a medium tends to our ends, that is, affection through application.

499. 6. *Therefore as the love is, and the more strongly it reigns, such is the affection thence arising.* 1. It is lowest and most perverse if it be only for the sake of the pleasures of the body and earthly pleasures, and there is nothing in it above that; such affections are irrational and purely animal. 2. Superior corporeal affection is for the sake of imaginary pleasures or those in causes, as various delights of ideas and the mere passions of the animus, as in avarice, in which we are of the opinion that for us all pleasures are in power. 3. Still more superior are the loves of self and ambitions, so that one believes that he is more than human society, which he does not fear to injure, if only all utility yields to him. 4. Still more superior are those for the sake of general society; this is truly human. 5. The supreme are those for the sake of the glory of the Divinity; this is spiritual, superhuman, and a divine gift.

500. 7. *Inferior loves fight naturally with superior ones;* 1. as the pleasures of the body and the world with loves in the cause, as in avarice, which spurns every pleasure; 2. avarice with ambition; for the ambitious man lays no weight on wealth, and he contemns the avaricious. 3. Common love fights with the love of self; for he who is led by love towards the public loves himself the less; he acts the Roman, as he wishes to be a sacrifice for the public good. 4. The supreme love or that of the Divinity combats frequently with the love of society in natural things, but not in spiritual things; 5. wherefore the love of society and of the glory of the Divinity are consociated; that love is the neighbor of this degree, for it is enjoined upon man as human that he should love society more the inferior, the less the superior loves rule; and thus vice the truly human, thus the love of self is put off, and one is in the way to true love. 7. The purest love is, that one love the Divinity, not for the sake of oneself and one's own happiness, but for the sake of the Divinity itself. 8. I do not know whether this purest love is possible in the body except by the immediate operation of God.

501. 8. *Thus the more inferior loves recede, the more superior loves can flow in*, 1. Since the battle is of all, therefore inferior loves are to be repelled as enemies. 2. Therefore the more inferior, the less the superior loves rule; and thus vice versa the grace of the Divinity accedes. 3. And, that inferior loves may perish, is brought about in various ways, naturally by combats with us, by removals, by true intuitions of things, by prayers, by the grace of the Divinity. 4. Then to these are added the means of the Divine Providence, that is to say, diseases, unhappiness, spiritual temptations, the immediate grace of the Divinity, and endless other things. 5. As many as are the subjects, so many are the diverse media. 6. *Thence come all the affections which flow into our intellectual sensations, and they are the truths of goodness which precede, and the goodnesses of truth are what complete a thing.*

502. 9. *In a word intellectual truths result, either from the affections of the body or inferior affections, or from spiritual affections or superior ones; for the understanding is their center.*

503. 10. *The intellectual regarded in itself is only the supreme sensitive*; 1. it results from the faculty of calling forth ideas according to natural order. What its quality is, is recognized from the external or inferior senses; according to the inflowing (*alluentes*) forms of objects it becomes sensation and science. 2. But still *affection itself* is spiritual; such therefore as is the affection, such is the spirituality which is within; this must flow in that any form may exist. 3. *According to the affection the state is changed, and one becomes a man*; for every affection changes the state. 4. *Such therefore as is the state, such are the effects or actions thence resultant*, which are qualified according to the state, and this according to the affection, and this according to the understanding. 5. It is thus in lowest things and thus in highest things. 6. Wherefore without spiritual change of state, there could be no heavenly life.

These things are to be further properly noted, and more carefully examined: see hereafter in the Summary.

504. 1. *There is natural affection and spiritual affection.* 2. Natural affection has harmonies for its foundation, wherefore it may also be called Harmonic affection. 3. But spiritual affection has ends for a foundation, thus the progression of means to ultimate ends or uses, so far as they are loves, 4. and so far as spiritual affection has respect to the harmonious fluxion of causes to effects, and so far as all causes and effects flow to their own uses, and the uses have respect to loves, and agree to that end.

505. 2. *There is a mixed affection, which partakes of the natural and of the spiritual.* 1. That is to say, it is one which has respect simply to uses, whether natural or moral; 2. nor does it openly have respect to any love which is within the use. 3. This affection can be called moral. 4. Wherefore there are affections, natural, moral, and spiritual.

506. 3. *Natural affection is divided into the sensitive, the imaginative and the intellectual,* 1. or what amounts to the same thing, into the corporeal or material, which is of the external senses or the countenance; into the physical which is of the imagination, or is the animus; and into the philosophical, which is the understanding or mind. 2. All this affection has respect to the harmony of objects or to the modification of objects originating in figure and form; 3. wherefore it is called harmonic.

507. *Sensitive affection has respect merely to the figures of objects; wherefore of their general and particular qualities.* 1. Thus touch has respect to whatever variously titillates, or hurts; 2. taste, to the figures of parts; 3. likewise smell; 4. hearing, to the harmonies of sounds; 5. sight, to the harmonies of objects, of colors, of shade and light. 6. *This sensitive affection coincides entirely with sensation;* for it does not perceive the figures, but the qualities thence resulting.

508. *Imaginative or physical affection, like to the visual, has respect to images as ideas, which it disposes into a new order; thence is harmonic affection.* 1. It is called merely harmony, while the objects of sight are excited in a simple manner, 2. or many affections perceived by sight are arranged among themselves into a natural order. 3. There are changes

of state in the cortex of the brain which have excited sensual or visual modifications. 4. The harmony among those states, makes this affection.

509. *Intellectual or philosophic affection has respect to immaterial or more highly elevated ideas;* 1. and they have respect especially to what is true and what is false. 2. Wherefore also there is a harmony of objects. 3. As imagination draws and composes its ideas from sight, so does thought from memory. 4. These ideas are called truths and falsities.

510. *All these natural affections, because they are harmonious, presuppose geometrical and analytical elements and principles.* 1. As the affection of touch, taste and smell considers only figures, thence their qualities are geometrical. 2. Likewise the affection of hearing, whence is music, which comes under analytical calculus. 3. Likewise the affection of sight, whence is optics which is likewise subject to geometry and its figures. 4. Likewise the imaginative affection; it has respect especially to optics, and those things which do not fall under that sphere have reference to geometrical principles. 5. Thence is physical geometry which is very extensive. 6. Likewise the philosophical affection; this acknowledges inductions and series, as analysis acknowledges geometrical principles; 7. wherefore also it enters into geometrical principles and is called analysis; 8. and by many at this day it is referred thither, and demonstrated by geometrical rules.

511. *This philosophical affection is inmost sensation, which is called understanding.* 1. For it arises from the ideas of the memory, 2. and consists only of changes of state, and of their harmony. 3. It results therefore from the ideas of the memory, while the soul cooperates, which soul is the order and norm of the natural things of its own body, 4. which has constructed for itself the single subject after the image of itself, in which therefore the order is. 5. Wherefore whatever is suitable to its order and nature, and at the same time, to the order and nature of the universe, this is known as truth. 6. For all things are thus geometrically circumstanced, as has been said. 7. Therefore brute animals, which refer their ideas immediately to their soul, not to an understanding, produces

such geometrical wonders, as nests, as bees do their comb, as do spiders, as beavers, etc. 8. It is otherwise with men who refer their sensations to the medium of principles or to the intellectual, 9. and since it is perfected by these sensations, and those things are mere principles, hence things are otherwise circumstanced in man.

512. *Inferior affections flow into superior ones, and the superior into the inferior, but with much difference.* 1. While inferior affections flow into superior ones, then the state of the inferior affections is active, and that of the superior is passive or only reactive. 2. But while the superior flow into the inferior then the state of the superior is active, and that of the inferior is passive. 3. While superior affections are acting, the inferior ought to be quiet, not so vice versa. 4. The more inferior affections are quiet, the better is the active state of the superior ones. 5. In the time of infancy inferior affections act upon the superior ones; 6. but in the time of old age superior affections are active, while inferior affections are quiet. 7. Common sense thence derives its origin.

513. *This is the faculty of thinking and of judging,* 1. which is thus inmost sensation, 2. with which the faculty of the soul immediately concurs. 3. It is only intellectual light (*lumen*), 4. which is natural, because it perceives the truths in the order of its nature, and the harmonic things of the universe; 5. thus what is true or what is false. 6. It is *therefore simply goodness of form* which perceives this affection.

514. *The proximately inferior faculty perceives according to the state put upon the intellectual faculty,* 1. for the inferior depends upon the superior. 2. Thence the superior frequently persuades the inferior as to what is harmonious. 3. We learn all things by a posterior, sensitive or analytical way; 4. wherefore on the science of that faculty depend the harmonies of the inferior faculty. 5. Thus also it is with the sensation of hearing and sight; 6. but not so indeed with touch and smell, except obscurely so far as we know or believe that there is evil in the objects.

515. 4. *In a summary:* Natural affection arises from the harmony of ideas and series in the analysis of the thoughts

which conclude; whence a kind of delight exists; but it is only the harmony of the changes of state, which agree with the state now induced *a posteriori*, that is, from principles; for whatever is within the understanding, which is composed into analytical series; this being received is carried to the senses or to the posterior way, thence the understanding puts on its own state and order, wherefore there is a harmony of the changes of state which concords with the harmony of the modifications. But still they are not truths, for truths flow in by a prior way or that of the soul; this is not learned or established in its own state, but is in its own order and natural state, if the representations of the mind agree with the representations of the soul, then natural truth is produced. The soul does not flow in except with common life, as the sun does into the eye with common light (*lumen*), with the help of which images and apparitions appear, not such as they ought to be, but such as they are projected. The soul perceives these changes, or causes them to be perceived intellectually; but it does not therefore concord; if the soul concorded then there would be a true harmonious affection, and the analytic form itself would be truth; this cannot be done, if we have been instructed in principles, and we do not permit the soul with its light (*lumen*) and life to flow in and conform the very forms of our thoughts into order for itself and the nature of the universe; for this intuition of the soul can be called the representation of the universe; but how the soul can flow into the truths of this species, would be too prolix to set forth; that is to say, the mind is to be imbued with no principles, the mind must have been gifted with common sense, it must have intuition only of things which are offered to it, it must disperse particulars, nor ought it to have any faith, unless all and single things coincide; in these things which are to be produced the mind ought to be active; it must itself submit to the connection of things, as it were, to the superior mind, to harmonize the form; then the soul is active, and the mind passive, or the soul actuates the principal cause, the mind the instrumental; then truth flows in as if of its own will, to which the mind is forced to assent, because the order of the

universe conspires; then a kind of harmonic affection, assent and delight find place. But the mind itself ought to be in that state, so that it may be in order and truth, or it ought to be reduced to that state, otherwise it would be in vain, and in the place of truths hypotheses would find place. When the mind is constituted in this state, then infinite things are divinely provided, which contribute to the perfecting of the thing; and it cannot be in that state, unless at the same time it be in a more perfect moral and spiritual state, saying, as it were, good bye to the world and the body; thus being in the body, as it were, separate from the body, so that it may admit superior influxes more than the inferior which disturb.

516. 5. *Spiritual affection.*

NB. NB.

General Exposition, in Summary

Sensation and Affection.

517. *Sensation gives birth to affection; affection is of what is good or what is evil; the affection of what is good is love, of what is evil is hate. The love of good involves harmony; harmony conjunction. Therefore good and evil are the principles of all affections.*

518. *The external senses recognize good and evil, through the affections; imagination through reproduction and through new production from the memory, from this inmost memory or that of the understanding, which through its faculty calling forth and analytically forming ideas, explores truths, then the qualities of truth, especially the inmost memory, or that of the understanding, that is, looks to see whether it be truly or falsely good, or truly or falsely evil; in and under the cognition itself of truth lies hidden good or evil, by which sensation is affected; sensation is affected according to natural and acquired order, in which is the very organism of life.*

519. *What the truly good and truly evil is, is recognized, especially from the love which is in the affection of the sensations. The lowest love is that of the world; the love proximately superior the principal cause of that love, is the love of the body; still more superior is the love of ourselves, whence is ambition; still more superior is the love of society, which*

increases by degrees according to the quality or the natural moral and spiritual bond, and according to quantity or universality; still more superior is the love of heavenly society; the supreme love is the love of God.

520. *That loves thus ascend, is evident from this induction. Our bodies are for the sake of the world, the internal faculties of the body, whence is the love of ourselves, are not for the sake of the body; human societies are not for the sake of ourselves, heavenly society is not for the sake of earthly society, but the reverse. Thus neither is God for the sake of heavenly society, but this society is for the sake of His glory.*

521. *Thus true and pure love, and the true and highest good is God, from Whom, as from its own first, is all love, wherefore the affection of good, felicity, harmony and conjunction; thus also descends all intelligence of truth.*

522. *Such therefore as is the love, such is the affection of good; such as is the affection of good, such is the state; such as is the state, such is the life and felicity, because such is the harmony and conjunction. Wherefore, such as is the love, such is the intelligence of truth; thence truth flows forth as from its own fountain.*

But as to particulars.

523. *1. Sensation gives birth to affection. 1. Affections, as sensations, are inferior and superior, 2. or exterior, as those of the senses, interior, as those of the imagination or superior sense, or of the inferior understanding, and the inmost are those of the intellectual perception, or of our mind. 3. These are the affections which come to our consciousness.*

524. *Affections are natural, rational or spiritual; thus in our body they are variously mixed. 2. Natural affections flow from the soul and its nature, and the order in which it is. 3. Rational affections, also to be called voluntary, are our very own, or they flow forth from our mind. 4. Spiritual affections are still more superior, that is to say, of the supreme mind; these are communicated to us by the soul.*

525. *That sensation gives birth to affection, see above; 1. In the external senses, as in touch, the affection is gentleness, softness, soothing, or harshness, pricking, hurting, whence the*

affection of pain, (see above); 2. in taste, as what is sweet, tender, or what is offensive, pungent, (see above); 3. in smell, as what is fragrant, offensively smelling, (see above); 4. in hearing, as what is harmonious or disharmonious, (see above); 5. in sight, what is handsome, beautiful, or what is ugly, (see above). 6. In the imagination it is either the harmonious, as in melody, optics, whence is delight flowing forth from the modification of hearing and sight; or it is what is appetizing, whence is appetite, from the imagination of sweetness originating in taste and smell; or what is desirable, whence are the *cupidities of the animus*, from the love of one's own body, from the natural or rational love of conservation, or from the irrational love of keeping or taking more than is right. 6^a. These are the affections of the imagination respectively to the visible world without one, and the sensitive world within one. 7. The affections of the mind are also where there are delights, loves of ends, loves of self or ambitions; and like things, 8. and they are our own because they are of the mind. 9. They are natural, from nature itself or from cultivation, either first or second nature, or they are our own and are learned, arising from received principles, ends and comprehended loves; or they are spiritual.

526. External sensations are merely affections, 2. for they are affected immediately according to the qualities of form. 3. Sensation itself is the reception of form, wherefore it is affection. 4. Imagination is either the calling forth of visual form from the memory, whence there is an affection like as if we, being present, were looking at it, 5. or it is the production or creation of new form, by the composition of many things which have been seen, or by sciences and arts. 6. But there are many affections which have respect to the moral world or to human society; 7. thus they are moral affections, and have respect to what is useful, decorous, or honorable. 8. What is useful has respect to the wealth of the world, or to use in society; one adds wealth to himself, that he may be great as he abounds in it. 9. What is decorous, that one may be handsome in face, gesture and manners, that, as it has respect to the form of what is honorable. 10. What is honorable, that

all virtues may exist. 11. All these things, which affect according to their form and nature, arise from sensation. 12. *For there is nothing in which there is not form, there is no form in which there is not quality, no quality which does not affect the life in its own way, and no affection in which there is not love, no good in which there is not love, appetite, desire, and no evil in which there is not hatred, aversion, flight.*

527. *All affections have respect to objects, either in the world or in oneself, or in the society of many, or in heaven.*

528. 2. *The affection of good is love, and that of evil is hate.* 1. In the senses it gives attention to the good, the delightful, the harmonious, the handsome; 2. in the imagination, likewise the harmonious and handsome, whence delectation, gladness; then also the convenience of the body, the desirable, the lovely, the excellent, the longed for (*cupitum*), thence is cupidity. 3. In the mind it looks to the analytical, the desirable, the good. 4. In superior things also it looks to the good, even to the highest good. 4^a. Love remains in every degree from the lowest to the highest, whence is the lovely, for it is the center of all the affections, for thence also they are derived, therefore the name does not change. 5. Hatred is the contrary, whence is aversion. 6. There are endless intermediates. 7. Without a disquisition on the true and the false, the good and the evil, there is no human reason, nor speech, except affection alone.

529. 3. *Love of the good involves harmony.* 1. Thus love, or the good is excited by harmony in inferior things; thus love produces harmony in superior things. 2. Harmony is in things simultaneous, wherefore in their forms and figures. 3. It involves therefore geometry, physics and all its parts, yea, philosophy itself or analyses. 4. Harmony also is of things successive; this is circumstanced similarly to the harmony of things simultaneous. 5. For the simultaneous arose from things successive in nature; wherefore the one is recognized from the other. 6. There are relations of differences which create harmony between two opposites. 7. But of what quality the harmony of things successive would be is not recognized

from simultaneous harmonies, except one be keen scented. 8. Equation consists of mere analogies, and these of ratios. 9. Thus hate involves disharmony, because destruction.

530. 4. *Harmony (involves) conjunction.* 1. This is the reason why it gives attention to what is harmonious. 2. Because it gives attention, as it were, to one thing, nor to anything dissonant or ugly. 3. Because there is nothing which destroys it. 4. As, therefore, is the union, such is the harmony. 5. The harmonies of modifications or sensations unite in the cortex. 6. Thus disharmony (involves) disjunction. 7. Wherefore the ancients imagined to themselves, that love created the world, or that in the world there is pure harmony; and that love itself separated it out of chaos and reduced it into concord. 8. These things can be illustrated by endless examples in notes.

531. 5. *Therefore the good and the evil are the principles of all affections.* 1. Affection itself is of the life, which feels, and harmony is of nature. 2. Wherefore good is produced through harmony, and in the inferior animate or living world, harmony produces good, and good, love. 3. In superior nature love produces good, and the good, harmony. 4. Sensations are affected according to the nature of goodness, because according to the harmony of forms, and so forth. 5. In every sense there is good and evil. 6. There are endless intermediate affections. 7. There are mixed affections. 8. Thus there is material for much extension.

532. 6. *The external senses recognize the good and the evil through the affections;* 1. but through the affections and their differences; 2. or, what is within touch; 3. of what qualities are the forms of the parts in things edible, through taste; 4. and of what are the forms in atmospheric effluvia, through smell; 5. of what quality is the harmony of modification, through hearing; 6. and of what is the beauty in images, and objects, through sight; for the things which touch are objects, and thus according to the quality of form they excite and affect the sensory; thence is sensation. 7. Thus the science of objects is derived from affection, not affection from sensa-

tion; 8. for it is excited by many external, unseen causes at the same time or by a common impulsive force of many things.

533. 7. *Imagination takes place by reproduction, and by new production from the memory.* 1. The memory of imaginations is, as it were, the campus of objects which enter through the external senses. 2. Thus a kind of new visible world is formed within us by the senses, 3. under a visible form. 4. Imagination, strictly so called, is when those objects, now ideas, are reproduced similarly as they had entered; it is also called remembrance. 4^a. Thus it reproduces images of sight, as palaces, fields, all species, societies and other things. 5. These are common ideas, to which one formula of expression is applied. 6. From these, more simple ideas are led forth, like the parts of which those things are composed; as the idea of the sky, from this are brought forth its parts, as the idea of the stars, of the sun, and so forth. 7. These things are called forth either through the experience of sight or through the sciences; 8. if by the latter, it is done by the aid of thought or understanding. 9. These things are similarly exposed in the field of the memory, but distinctly in their own places. 10. Thus further, still more distinctly and interiorly. 11. This memory thus furnished is, as it were, the campus, from which the inmost sense takes its objects, which are now called ideas, as the external sensations take their modes and their images from the campus of the universe or the world, 12. thus each sense, as well the inmost as the outmost, outside themselves. 13. It is the part of the imagination to reproduce those things, 14. but when excited by the external senses, or by the appetites of the body, or by one's other loves respectively to the moral world, or to the society in which one is. 15. Thus it is reproduced by three causes, namely, 1. by the objects of the visible world, wherefore by the harmony of its objects; 2. by causes in the body, as hunger, and other, as it were, instincts for preserving, renewing and caressing the body, whence are the appetites; thus are excited the affections of the sense of taste and smell; 3. by the objects of the social world or those met in society, and by reflections on oneself, thence all the affections of the animus, from respect of oneself to that of societies. 16. These are reproductions, because the ideas of the memory are

raised up from objects entering through the senses. 17. But new productions exist either from nature, as in brutes, whence there are wonderful instincts, as well as to the geometrical harmonies of the world as to the appetites of the body, as also mutual loves of their own society; 18. also in some men there are similar instincts, which, however, are called inclinations. 19. But imagination is produced especially in the human race not by nature, but by oneself by the rational mind, 20. especially by means of sciences and arts, into which a man ought to be inaugurated. 21. Inclination accedes thereto. 22. The imagination which is reproduced has no other cognition or science than the external sensations themselves, that is to say, the affections. 23. But the imagination indeed which is produced, or the imagination formed anew from these things, acknowledges either nature as a cause superior to itself and its order in itself, 24. or it acknowledges its own proper mind, and its sciences and arts, according to the rules of which, wherefore according to the acquired or formed order of which, it is instituted. 25. Wherefore no cognition of goodness can be ascribed to the imagination, as from itself, but from things either inferior to itself, or superior to itself. 26. The whole science of the imagination is memory; 27. thus the science of the quality of good or of form, of which goodness and harmony are predicated, resides in its memory, which is thus separated from affection. 28. Thus imagination judges nothing, that is, does not examine the truths of goodness, but only reproduces them, or produces new truths; 29. and indeed, from causes above recounted, the imagination is only the mediate faculty, in which the rational mind is instructed, and by which it determines its will into act, especially into acts of speech. 30. Thus the imagination knows goods, either by affections, or by previous science, or by nature, thus not from herself, but from things inferior or superior to herself, upon which she as a mediate and mediating faculty depends. 31. That alone seems to have its own and what is proper, which can reproduce something from culture which is fixed in its memory, as in sleep walking and in nocturnal and diurnal phantasms. (These things, strictly and briefly, and in the exposition itself, are almost confused.)

(To be continued.)

THE NEW PHILOSOPHY.

VOL. XIII.

OCTOBER, 1910.

No. 4.

Editorial Notes

THE SWEDENBORG CONGRESS.

The Swedenborg Congress held in London last July, and at which the SWEDENBORG SCIENTIFIC ASSOCIATION was duly represented, was, beyond a doubt, successful in disseminating something of a just conception of the life and work of Emanuel Swedenborg. The King of Sweden graciously consented to become patron of the meeting; Count Wrangel, the Swedish ambassador to Great Britain, was its honorary president, and, as representing the Swedish House of Nobles, of which Swedenborg was a member, delivered a message of congratulation and good will; similar messages were also received by representatives of various learned bodies, including the Swedish Academy of Sciences, and the University of Upsala. Papers on Swedenborg's anatomical discoveries were delivered by medical and scientific men, including the eminent anatomist, Professor Ramstrom, and our learned friend, Professor Neuberger; and on his philosophy and theology by representatives of the New Church. The effect of all these papers, together with the able addresses of the President, Mr. E. J. Broadfield, was to present Emanuel Swedenborg as a man famous in his own day, but destined to be immeasurably more famous in days to come. And the fruits of the Congress were not confined to the large audiences which attended the meetings; for larger audiences, by far, were reached by the many favorable notices of the English and foreign press. There can be no doubt that the thoughts that were presented and the favorable publicity that was given will lead to a far greater measure of attention to Swedenborg, and, with some, to a new, or a deeper

and more extended study of his science, philosophy, and theology.

THE MEETING OF PUBLISHERS.

On Monday, July 11, immediately after the Congress, a meeting of representatives of New Church publishing bodies was held at the rooms of the London Swedenborg Society. At this meeting, where our Association was represented by President Sewall and the editor of the *NEW PHILOSOPHY*, important decisions were reached looking to the avoidance of needless duplication in the publication of Swedenborg's Writings. But the most important business was that which concerned the phototyping of Swedenborg's MSS. Arrangements were made for subscriptions from the various publishing bodies aggregating about \$4,000 a year for not less than five years; and with this support, the completion of the phototyping of all the theological MSS., including the *ADVERSARIA*, seems well assured. The work is confined, for the present, to theological MSS., but we may reasonably hope that when this is completed, the phototyping of the remaining MSS. will be taken up.

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THE FIBRE.

TRANSLATED BY THE EDITOR.

CHAP. VIII. (*Continued.*)

141. *The comparison which has been instituted, further teaches us, that as from the left ventricle of the heart a cavity is continued through the middle of the artery even to the last ends of its ramifications, so a little sinus or the minute chamber of the cortical spherule is continued through the middle of the fibre.* This is evident in the heart, for its left ventricle is extended into only one great artery, which is the parent of all the arteries of the body. As to a like ventricle, little sinus, or chamber in every single cortical substance, see Trans. II, n. 124-128.

142. *So that every medullary fibre of the brain and nerve fibre of the body is pervious and transpirable, or is gifted with a cavity, that it is to say, is a little canal, not unlike the arterial canal.* It behooves us to dwell somewhat on these matters, for there are those who still deny the permeability of the fibres,—an opinion which emanated from the peripatetic school. For the Philosopher,* in his work on Parts of Animals, Book II, Ch. IV, has stated that the fibres are solid and earthly; and he thus seems to have so hardened these stems of our life and so stopped them up, that they could not be opened by Hippocrates, who asserts that there is nothing in the animal body which is not perspirable† and transpirable. That a cavity and a fluid runs through the fibre as through the artery, is indeed hardly perceived by the senses, but is quite evidently perceived by the mind. Those who judge of such things merely from the senses, are rebuked by PLATO in his *Theætetus*, in the following remarks: “There are uninitiated persons who esteem

*By “the Philosopher” our author means Aristotle, whom he frequently designates in this way.

†The word is used in its root meaning, namely, open to the passage of air or breath, *i. e.*, pervious.

that nothing exists except what they have grasped with their hands; but efficiencies of actions and the generations and origins of things, in fine, whatsoever does not come under their eyes, this, least of all, do they believe to be in the class of things that exist. Truly, such persons are exceeding gross and are strangers to the muses," pages 155, 156 in my copy [Stephens' edition, p. 155]. Aristotle himself also speaks likewise, saying: "Ignorance of our superiority and of other matters springs from the fact that we are impelled to learn from the senses alone, nor do we abstract our thought; but, drawing our learning from it, because we suppose ourselves to have experience of all things, therefore we are accustomed to say that there is nothing that does not fall under the senses." (*Divine Wisdom, according to the Egyptians*, Book XII, Ch. xx.) As to the cause of this ignorance, see in Trans. I, n. 623. But he who at this day, calls into question or gainsays the permeability of the fibres, he surely calls into question or gainsays experience enlightened by the microscope, that is to say, the evidence of sight. And therefore, that such a person may have faith in this truth, I am induced at this point to give a copious recital of the documents of experience.

WILLIS treats of these matters in the following words: "The nerves themselves, as may be detected by means of the microscope, are furnished throughout their whole extent with pores and passages as with so many alveola densely excavated and mutually contiguous. Thus their syringe like substance, like the Indian cane, is everywhere porous and pervious. Within these little spaces animal spirits blandly spring forth, or corpuscles extremely subtle and of their own nature ever prone to motion; to which is adjoined an aqueous humor, itself consisting of extremely subtle parts, which serves both as a vehicle and also as a retainer. This nervous juice, derived from the cerebrum and cerebellum into the medullary appendix, is carried thence, by an ever bland flow through the nerves into the whole nerve family, and irrigates its entire system. On the equable emanation of this fluid depends the expansion of the animal spirits throughout the whole system. And the substance of these spirits, yea, the hypostatic substance of the

sensitive soul itself, is founded on the diffusion of this same humor." (n. 8.)

BARTHOLIN. "The use of the nerves is that, like canals, they shall convey the animal faculty received with the animal spirit from the brain, to the sensory parts, as to the eyes, ear, etc., to the motory parts, as to the muscles, and to almost all parts that, in general, they may sensate and may recognize the things that bring them pain. The use of all the nerves is to carry animal spirit to all the parts, for the sake of sensation and motion, as is evident from their injury. For when obstructed in their beginning—if the obstruction be total, both sensation and motion perish and apoplexy results, or if it be on one side there is privation of sensation and motion on the other side; if they be cut, the motion of the side into which they were inserted is destroyed." (n. 12, 15.)

VIEUSSENS. "The animal spirit runs through the nerve in many distinct and inexplicable ways, so that it accomplishes within it many distinct and inexplicable motions, for the diverse ratio whereof diverse thoughts are excited in the soul." [n. 17.]

RIDLEY. "I regard the fibre as being either an extension of some artery which by reason of its minuteness is rendered fit to contain only a liquid of this kind; or a tubulous production of the same kind of artery corresponding in the proportion of its opening or pore to the figure and magnitude of that fluid which nature intends it to receive. I hold that the fibre is incapable of taking up any fluid whatsoever, which has not first been reduced into the most minute particles, a process which comes under the name of Leptometry. These latter vessels, I have held, are nothing else than the numerous still further capillary productions of the cortical vessels; so that the red vessels, or vessels of the blood, cause them to be gifted with a pore of such kind as renders them fit to receive only that most subtle, fine, and mild liquor, which, I take it, is the true medullary and nerve juice," etc. (n. 18.)

MALPHIGI. "Whether these fibrous bodies are hollow, or at any rate, whether, when gathered into a fascicle, they transmit the juice peculiar to the resultant little pores and interstices

into the nerves continued therefrom, is a matter that would require long investigation. The extremity of the fibres of which the brain is made up seems to be no light argument in favor of the existence of a separate humor existing in the brain and propagated therefrom into the nerves. For in its last little heads or roots the fibre is immersed in the cortex through which are ramified an immense abundance of blood vessels. From these circumstances we have reason for thinking that, in its inmost structure, the cortex or the cineritious substance derives into the fibres a fluid which is expelled from the vessels." (n. 21.) "That nerve fibres of this kind are to be classed as vessels, seems to be indicated by the well known fact, to wit, that when they are cut, a copious juice flows out, resembling the white of egg and condensable by fire, as I have observed in a dissected nerve of the arm." (n. 20.) "Although we find in the cerebrum a net-like interweaving of fibres still the humor of these filaments is not to be carried down by external adhesion, as is the case in sponges; for the whole work of separating and purifying is perfected in the inmost structure of the cortical glands; and the humor which then issues from the glands, enters into the hollow and tubular fibres, and, by a continuous path, is sent off into the underlying parts for the performance of diverse offices; as is the case in the tubular stems of vegetables, as intimated above," (*ibid.*).

LEEUEHNOEK, who was furnished with better glasses, frequently beheld the cavities themselves with still clearer sight and exhibited them to the view of others. "Not content with this observation, I endeavored, with what reason I could, to find out whether the little parts which I have spoken of as being very fine and somewhat longish, are interiorly pervious with hollow passages. At last, after some days, I distinctly recognized those passages or cavities with my own eyes, and this not once, but at least twenty-five times." (n. 26.) "In one respect I was unfortunate in this business, namely, in that I was unable to exhibit these cavities to the sight of others; for as soon as I move them to my eyes for the purpose of examination, immediately and in less than a minute, they so col-

lapse by drying out, that the remarkable sight wholly vanishes beyond the possibility of being restored by any industry. Nor did I see merely the borders of these vessels,—vessels which seem to be gathered together to the number of some hundreds in order to make up a single nerve,—but in some of them, I also recognized the cavities, and this as distinctly as though we had perforated a piece of paper in a number of places with a very fine needle.” (n. 27.) He presents a delineation of the cavities themselves in Fig. I., to the description of which figure the reader is referred; see, n. 29. “Nor can I add anything to what I have said above, [he continues], except that, because I was investigating the hollow passages of the vessels, I may have perceived them more clearly than before. [I showed the things described above to a certain man through the microscope], and to my question, Did he not see the extremely minute vessels, and the foramina or openings of the vessels, he answered, Yes, I saw them at first sight. I then told him that what he had seen was a minute portion of those open little vessels of which the nerve is contextured.” (n. 30.) “In the nerves of a calf, I found these passages not once only but many times,—a fact that gave me no little delight (n. 34).”

BOERHAAVE closes the array: “Whoever considers, 1. the nature of the cortex as set forth above, and the fact that the medullary fibrils arise from it in the most distinct way; 2. the similarity of this arrangement, with every other part of the body; 3. the vast abundance of the very finest, purest, and most mobile arterial blood, undespoiled of its subtlest part, that is driven hither with great force by the neighboring heart; 4. the exquisitely fine fluid always and everywhere to be found by sight, touch, and especially by the microscope, within the medullary substance when dissected,—a fluid which in diseases of the injured brain, is often greatly augmented; 5. the fact that the veins return to the heart the blood which has been brought by veins from the pia mater and the cortex of the cerebrum and cerebellum to the venous sinuses; 6. the constant, ordered and proportioned increase, nourishment, propagation and return of these stamens from the first point of life

to the goal of life,—such a one must judge these fibres to be pervious little channels of the utmost fineness, that take up a humor, the most subtle of all in the human body, which, prepared and secreted in the wonderful fabric of the cortex and driven by force into these tubes, is collected from every point of the cortex into the medulla oblongata. If further, with attentive mind, one comprehends, 1. that the whole vascular medulla is expended on the constitution of nerve fibrils, yea, goes off into such fibrils by mere continuous extension; 2. that when the medulla of the cerebrum or cerebellum is compressed, cut, rotted, eaten away, every action accustomed to be done through the nerves arising therefrom, is at once abolished, even though the nerves continue unimpaired, and with membranes intact; 3. that the nerves, everywhere lax, pendulous, curved, retrogressive, oblique, yet execute motions and sensation with the utmost promptitude; 4. that, nevertheless, when compressed by constriction, the nerves, even though unimpaired, lose every faculty of motion and sensation in the parts that lie between the ligature and the last places to which those nerves are extended, their power between the point of ligature and the medulla of the cerebrum and cerebellum being unaffected,—he will most certainly conclude that the nerve fibrils assiduously receive the humor of the medulla, transmit it, and carry it down to every point of the whole body by the most distinct paths. Does it then seem wonderful to you that the eye cannot follow the presence and motion of this humor; that ligatures, wounds, punctures, suction, air pumps, injections are of no avail to exhibit it before the eye; that by no skill can the cavities of the nerves be laid before the keenness of its vision. Truly, he who attempts such things with this intention, knows not the nature of these vessels and of the liquor itself. But he who, on this account, denies the existence, in these little vessels, of cavities that flee the sight, and elude the skill, is surely ignorant of the rationale of our body in its origin, progress, operations, and excretions; and knows not the structure of insects, nor gives heed to the phenomena which so manifestly occur in plants. Therefore also gross is that error which recognizes the thickish lymph that trickles from the cut nerves

of an ox's tail, as that humor, which we have just described." (n. 49-51.)

See now the common agreement of the anatomists of our age with Hippocrates, as against ancient and modern philosophers who hold the contrary opinion.

143. *In addition to experience, reason also dictates the same thing; for without a fluid in the fibres nothing whatever in the animate body could derive and carry on its origin, progression, order, law, motor force, light, life and sensation; since a fibre without a fluid is a stem impotent of action.* But let us take up these points one by one. As regards *origin* and *progression*; this is evident from the thorough examinations that have been made on the beginnings of chicks in eggs and of embryos in wombs. For the fluid of the white and of the yolk is brought, by insensible pathways and pores and through intermediate vesicles, towards the carina,* and from this into the purest stamens, which, flowing forth from the tender little brains, enter upon the work of successively constructing the fabric of the viscera. Unless the fibre then emerging were determined according to the force of its fluid and the impetus of nature, or in the direction whither its soul leads, nothing of organic form, and no machine of such stupendous skill and genius, would ever be raised up. Compare the whole of Transaction I., chap. iii, on the Beginnings of the Chick in the Egg. [n. 241-315.] As regards *order* and *law*; for there would be no order and no law of order, unless there were a fluid capable of determination according to every force and mode of active nature. That fluids are the forces of nature, and that substances declare their quality by the mode of their forces, see Transaction II., n. 223. As regards *motor force*, as in muscles, glands, vessels; for when the fibre is compressed, or emptied, or distended with useless humors, or exhausted and worn out by old age, or infected with a wasting disease, it so undermines and demolishes the former strength of the muscles, that particular activities are turned into general, and there arises inability to exercise the single powers according to the

*The medulla or first stem of the chick or fœtus.

decisions of the soul. As regards *life* and *sensation*; for if no such quantity of the animal fluid were reborn as, so to speak, is unborn; that is to say, if the fount of the vital humors begins to dry up; then, with the collapse of the fibres, the organs of sensation grow dull, and the very life of the body enters, as it were, into the shades of evening,—as is indicated by the single changes of state in ourselves. Suppose now the fibres to be without fluid; tell me, how they exist, how they subsist, how they are nourished, how they act, suffer, live, and feel; or, tell me what animates the fibre, and what deprives it of animation. Is it not a fact that as far as the fibre is lacking in liquid, so far it loses its potency of action and sensation? not unlike as is the case in the umbilical and other vessels, which were formerly pervious to the blood, but becoming; in process of time, emptied of blood, they are seen to take on the nature of ligaments and tendons. Let us therefore open up the fibres and consider it established that they are little channels; for thus shall we have a pathway, open and clear, to the causes and principles of things in the animal kingdom; and we shall be persuaded that it is from the marriage of the fluid with its fibre, according to the ratio in which they live together, that we move, and sense, and live. Add to this what is said in Transaction II., n. 165.

144. *Moreover, as the muscular surface of the heart is transmitted by continuity into the surface of the artery, so the surface of every part of the cortex is transmitted around its fibre.* There is no doubt but that the muscular fibre of the heart is continued into the great artery,* and from this into all the small arteries or capillaries, yea, even into the little veins, so that it returns into the heart; for otherwise, that is to say, in parts that are discontinuous, the systole and dyastole of the heart and arteries, or of the whole arterial system, would cease. In addition to the muscular fibres, the superficial vessels also, otherwise called the coronary vessels, and, moreover, the cardiac nerves, are in part transmitted to the aorta. From the parallelism, a similar conclusion may be drawn in

*The aorta.

respect to the innumerable little hearts of the brain; that is to say, their lines, or rather the fibrous shades which weave their surface, pass by continuity into the fibre itself, and form its little tunic. See Trans. II., n. 114. The same is evident from the continuous action of the fibre from its beginning to its end; for there is no continuous action in things discontinuous.

145. *From the above considerations come the following conclusions: As in every point of the artery there is a likeness of the heart, so in every point of the fibre there is a likeness of the cortex.* By a likeness of the heart and cortex being in the arteries and fibres, I mean that they are as it were present in every point of them, although they themselves are not present individually, but only their force and power. It is not otherwise than is the case with a distant image in the eye, of which image only the likeness is present. In a similar way, the brain is said to be present in every point of the body. Without the presence of the heart in each point of the artery the latter would not beat almost simultaneously at the stroke of the heart; nor would the muscle act at the nod of the animus and at the first motion of the will; nor would the brain sensate, almost in an instant, the least differences of touches in the organs. And, therefore, in the brain, that is in the cortex, is a likeness of the things that are represented in the external sensories; and in the muscles a likeness of the things that are perceived by the animus. Wherefore the formative force and substance, that is to say, the soul, is seen to have fashioned its body entirely after its own idea, or as a type of its own intuitions and representations; confer Trans. I., chap. iii. The cause and truth of this theorem is a consequence from the preceeding theorem of this chapter, namely, that the artery is a continued heart, and the fibre a production of the cortex, or its elongated appendix, etc., n. 133, 134, 135, 144; see also Trans. I., n. 173-179, 182-186; Trans. II., n. 202.

146. *For from the origin of their motion or touch both actuate their enclosed little stream into the things that follow.* This is the continuous effect of the cause. For blood injected in the arteries, even without the force of the heart, spontaneously flows to its exits, that is into the veins. Indeed, if you

constrict, puncture, or pinch an artery, the moments of the friction or touch may be distinctly discerned in the succeeding branches; and hence by the pressure of a plectrum or of the finger* on living arteries, we are able to produce an artificial pulse different from that of the heart. The reason is, because the artery, from the origin of its motion or touch, actuates its fluent blood into the things that follow. Hence it is evident that the office of the heart is to inject the sanguineous wavelet into the aorta, and that the rest belongs to that artery itself and to the arteries, in whose every point there is a likeness of the heart. See Trans. I., n. 169-189. A similar thing obtains, but still more perfectly, in the fibres. Wherefore the forces of the muscles are excited not only by the determination of the cortex, but also by every touch and friction in the body. See Trans. I., n. 506, 507, 508, 561, 570, 574; Trans. II., n. 32, 33.

(*To be continued.*)

**Plectro vei digilo comprimente.* A Plectrum is the stick used by the ancients to strike the chords of a musical instrument; our author seems to refer to a stick or other similar instrument,

perhaps technically called a "plectrum," used to assist in the compression of blood vessels. Can any of our medical readers throw light on this subject?

THE SENSES.

TRANSLATED BY E. S. PRICE, A. M.

CHAP. VII. (*Continued.*)

534. 8. *From this imagination is the inmost sensation or the human understanding, which by its faculty of calling forth and analytically considering and forming ideas, explores truths.*

1. Our understanding especially judges truths. 2. Truths are natural, moral and spiritual. 3. Truths are demonstrated by experience especially by that of the senses; they are demonstrated by causes inducted geometrically or in a geometrical manner, and by rational investigations or analyses. 4. Therefore, all practical and theoretical sciences, such as physics and its many parts, geometry and its parts, philosophy and its parts, 5. are sciences so far as they involve truths; wisdom is what also involves goodnesses. The understanding exists especially that we may be able to choose what is good, and indeed the best, and reject what is evil, especially the worst. 7. Wherefore in order that there may be choice, and that it may be imputed to us, the liberty of choosing is given, wherefore of thinking, judging, willing, and acting. 8. Truth can be assimilated to every form; in the form itself is the quality, which affects according to its perfection. 9. The perfection itself is the good which affects, whence is love in living things. 10. The exploration of perfections in themselves and among themselves is the office of truth; 11. wherefore without truth goodness is not explored, still less chosen. 12. The very affection of good, which affection is of the life which is from what is good or perfect, is natural, to such an extent that it need not be examined nor demonstrated by the understanding, thus as to whether it be delightful in the sense of touch, taste and smell, whether it be a harmony in song or music, whether it be beautiful in optics. 13. Science indeed points out the truth of goodness; 14. but on the other hand, we have spiritual truths from

revelation; for we grasp spiritual truths by no sense; 15. but still by sciences we can ascend even to the demonstrations of those perfections, especially by the doctrines of order and degrees, and also of forms; 16. but to be affected by them, or to love them, is Divine, and is of His grace. 17. No other principles are of the understanding, than what is true and what is false, and what is good and what is evil; without them and their relation to one another there would be no understanding, no reason nor speech; the sound by which affections are expressed would be sufficient; therefore there would be no ideas. 18. The understanding is especially engaged about the truths of goodness, and, in the understanding truths and goodnesses are separate; not so in brutes in whom they are conjoined and are bare affections, as in our external senses.

535. 9. *Then the qualities of truth;* 1. as in things geometrical, the qualities of form, given the most perfect, as that of the circle; 2. in music, the qualities of modifications; 3. likewise in optics. 4. All analogies among themselves give quality; 5. so also the sequence of means among themselves up to the end; 6. they all relate to form, and form to analogies and harmonies. 7. Thus it is in truth natural or physical, thus in moral, and thus in spiritual; 8. wherefore spiritual truths and substances are also called forms.

536. 10. *Thus now there is what is truly or falsely good, and what is truly or falsely evil.* 1. A thing is not good, because it appears to be good, thus neither is evil evil. 2. The good of taste and smell is not therefore good because it is delightful and sweet; 3. so in the animus and mind a thing is not therefore good because it is represented as good. 4. Respectively to the affection and love thence arising a thing is good or evil. 5. But the truth must be sought, as to what is better, and what relation they have to one another, whether this good destroys that which is better; 6. and many like things which are unlike. 7. What is evil is sometimes a means to what is good, etc., etc. 8. Therefore the medical art exists that we may not be deluded by the appearance of good in taste. 9. In the moral world, thence is the law of nature. 10. In things philosophical, thence is philosophy. 10. [a] Wherefore the un-

derstanding exists for that reason, that is, for the choice of good, for which the science of goodness in itself, and of goodnesses among themselves, is required.

537. 11. *In and under the very cognition of truth lies hidden what is good or what is evil, by which that sensation is affected.* 1. That good derives its origin from love, for that which we love, we believe to be good. 2. The affection itself of what is good is love, or comes from love. 3. For that which is harmony in the inanimate world, is love in the animate world; 4. as for example, if we wish to allure anyone to our love, then all the means tending thitherward are grateful, and we believe them to be good; 5. that goodness then, is in the very form of truth, and under it; 6. Thus if ambition of fame and glory be the end, then if we hatch out anything sublime, good is under it, although not within it. 7. It may be within, not under it, if it be not the means to that end.

538. 12. *This sensation is affected according to a natural or an acquired state, in which itself and its eminent organism is.* 1. We attribute an eminent organism to our rational mind; 2. which is within the cortical substance. 3. This is to be demonstrated. 4. This organism itself learns to take on endless changes of state, which are its ideas. 5. Wherefore that acquired state is given for the putting on of changes of state. 6. If this state coincides with the order of nature and with higher order it is the best. 6. A perverted state loves what is evil and false; 7. thus the devil and his sons; 8. it is their happiness, but it is truly unhappiness.

539. 13. *It is the part of inmost SENSATION, to distinguish by superior or immaterial ideas, causes from effects, and principles from causes analytically educed; so also consequences and conclusions from premises; ends from means; things present from things past; and to be affected by the very form of things successively determined or simultaneously existing, according to the connection in which they cohere together; thus to discern distinctly what things are better. Thus it is the part of sensation, to look to true and truer things, to distinguish them, thus to affirm, to deny, for instance that they are, what and of what quality they are, whence they are, and why they*

are. This is the perception of the understanding or the inmost sensation of the ideas set before it; they are subinsinuated either by the heard voice or the seen letter, of a teacher; or from one's very own field of ideas, that is from one's memory; thence is common sense which is the more perfect the more it is instructed, and the more agreeable the state of that sensation is to the order of superior nature, as also the more friendly it is naturally or as an acquired state. And because to every sense is given the faculty of changing its states according to affections resultant from the harmony or goodness of objects, so also to inmost sensation; thence is its faculty of THINKING things, that is to say, of variously revolving, complicating, determining the things set before it until analysis or the rational form emerging, by which it is affected, in which it acquiesces according to the affection; this is said to be its faculty of JUDGING; thus sensation and affection distinctly reside in our mind, and the series of its operations is so ordered that we can not be affected before we have perceived that this is so and that it is coherent. The objects of this sensation are therefore indeterminate ideas, such as are those of the theoretical senses, their laws and axioms, from which, when determined, results form, which is the conclusion determined from those ideas and applied to the state of the present thing. The single essential determinations, which constitute this form, and the forms themselves, are called truths, all of which as means look to the end, and are called intermediate ends, because they tend to the ulterior end; they are the ends which those forms or truths look to, and which the understanding explores; they are the good things, the better and the best which ought to be chosen, actually embraced, and loved according to their nature. It is the part of SCIENCE therefore to know these truths which manifest goodnesses, wherefore it is also its part to know the nature of goodnesses by aid of the faculty of thinking and judging, sensually from experience, physically by rules geometrically true, philosophically by reasons and analyses of the mind, thus by those explored by the analytical way. It is the part of INTELLIGENCE to regard ends in every series of the operations of the mind, and in its single moments, and to dis-

pose the series of ends of mediate ends to the ultimate end in order that they may be uses. It is the part of WISDOM to choose the better from the goods of ends, and the best from the better, which is the ultimate end of intelligence,—not only to choose, but also to will; not only to will, but also to do; so that it may take on a state conformable to the nature of that goodness; wherefore to pursue the felicity which results thence. It is the part of SUPERIOR WISDOM, not only to choose, will and do the best, but also to love it, wherefore to be affected by a goodness which it does not naturally feel. For that superior wisdom a superior intelligence is required, and a superior science which does not flow in by way of the senses or the posterior way, but by way of the soul or the prior way. This alone is left to the liberty of our understanding, to remove and dispel the inferior loves, which are sensible to us, that they may not stand in the way of the superior and supreme mind flowing in if it pleases; wherefore it pours in science, intelligence and superior wisdom; for inferior loves must be dulled and almost extinguished, so that in the sphere of our mind superior loves may live and rule. These increase in purity as inferior loves decrease. These now first come forth sensibly, and infinitely exceed inferior loves in loveliness. Thus we ascend from natural to spiritual life; for according to repeated demonstrations, a like affection corresponds to sensation, a like state, to affection, a like effect, to state, wherefore a like felicity to the best love which is called heavenly.

540. Therefore truth is the form from which, according to quality, perfection or harmony and goodness, affection results, or love and hate. 1. Thence what truth is, what goodness and what love and affection are, becomes evident; 2. for they are all distinct, although they appear to be together within. 3. Truth, which is affirmed or denied, is the analytical form of immaterial ideas, which being simple are indeterminate, such as the theoretical sciences contain, from which being determined composite forms flow, which are applied to use; for instance, the units of numbers are indeterminate, but they are determined by applications to civil and other uses; such therefore as are those simple truths, such are the compound

truths thence resulting. 4. The quality of form flows from its differences and the ratio of its determinations. 5. Every quality is more perfect or more imperfect. 6. The more perfect quality is always the better, because more harmonious; thence results goodness. 7. Affection is of life itself which is affected, according to the perfection of the form regarded in the perfection of its own order and state; as, for instance, modification, life being present, becomes sensation; thus this perfection of form or its harmony, which from life is called good, becomes affection, or love, or hate; for the affection of good is love, and the affection of evil is hate. Love, which is diminished according to mixture with other loves, has its own degrees; love will be pure if true, other loves being removed. Knowledge certainly precedes choice, wherefore truth, the choice of goodness, in the human mind. 8. From these things it is evident how truth is a requisite before goodness, and the knowledge of goodness before love; 9. and that these single things are arranged in the human understanding that man may derive the free will of choosing from himself, that is, from his understanding, which is his own; 10. but he does not derive from himself a love superior to his sensual part, except by superior means. 11. And he cannot have this free will by himself, but he can only dispose himself that he may have it, the Divine grace approving, yea even flowing into his dispositions. 12. This is left to the Divine Providence.

541. *We know what is truly good, and what is truly evil, especially from the love which is in the affection of our sensations.* 1. But reason dictates that that is not truly good by which we are sensibly affected; 2. for we are not affected by those things which are above our inmost sense. 3. but we judge otherwise.

542. *The lowest love is that of the world,* 1. or the love of those things which are outside us, and affect our sensations, or by means of our sensations, us; 2. and because love involves conjunction, we thus appropriate those things to ourselves, as though they were adjoined to us, and as though they were with us, and we in them. 3. Thus we believe ourselves to be very great so far as we are in possession of those things which are

outside, and by love so adjoin them to ourselves, that we respect ourselves in them, whence we draw the felicity of our life; 4. nor do we love them for the sake of uses, but for the sake of delights and affections. 5. Such things are of the external senses, as those which sweetly and pleasantly caress the body, as soft seats, couches, rubbings, titillations, are refreshments as to touch; 6. dainties and exquisite viands and nectars to the taste; 7. the fragrances of the garden and many things to the smell; 8. the delights of song and music and like things to the hearing; 9. all the beauties of nature to the sight; 10. many magnificences, as of clothing and endless other apparatus, which are outside us, and which affect the animus; 11. finally wealth, the goods of the world, because they are outside. 13. All these things are outside and affect the mind itself. 14. Hence the things which are outside us, and are not ours, but which by love we conjoin to ourselves as ours, and love merely for the sake of the delights, or for our own sake, not for the sake of a higher or superior end. 15. If we love those things for the sake of a superior end, then those ends are conjoined, and from them we receive delights from the delights of the end. 16. Thus they are not to be looked at as without us but within us, although they are without. 17. These things are known as pleasures, because they are in ultimates as in effects.

543. *The proximately superior love, for the sake of that principal love is the love of the body.* 1. The love of the body is within us, solely for the delights of the body and the animus, and not for the sake of better ends. 2. They are especially loves of the imagination or imaginary loves; 3. the loves of venery for the sake of delights alone, not for the sake of another end; 4. the loves of our beauty; 5. the loves of our gestures and manners, whence are various kinds of pride; 6. the loves of our knowledge, especially that of the memory, whence we believe ourselves wiser than others, while nevertheless we may be fools (*phantastæ*). 7. Thence are endless kinds of insanities. 8. They are excited by causes within us, by the blood, by the animal spirit; and not excited by causes without us but by our very selves; 9. even the very proportions of the blood excite those causes. 10. There are appetites of various

kinds. 11. There are amusements of various kinds, there are various kinds of pride and arrogance. 12. We regard society in ourselves, but not ourselves in society. 13. That we may flatter this love, we favor the lowest love, which is as it were the servant and the instrumental cause of it; wherefore this is called the principal cause. 14. Thus it can be conjoined with the prior, but it can also be separated.

544. In a word, all those things pertain to the loves of the body, 1. which arise out of the field of the memory; 2. as all those things which come immediately into the senses from the world; they should be referred to the loves of the world; 3. for there is another field of the world, as it were, formed in the memory. 4. Wherefore all those pleasures, appetites and loves of the body, or of the inferior part of man, pertain to this class. 5. Wherefore if they also affect the superior part of man, or his mind, or his inmost sensation, which is so much the worse, 9. all these loves are without an end or use, they are only for the sake of delectations, delights, appetites and loves of the body. 7. They are excited in the first place by the senses, or by the blood, thus by the body, or by the spirit of the blood, thus by the imagination itself, or by the rational mind, which then does not play its own part, but places ends in the love of the body, and not further. 8. Such, therefore, are all the passions or affections of the animus, as pride, revenge, anger, gladness, and many more; 9. especially avarice, which is the complex of all of them, for in wealth itself it regards the whole world, or the possibility of all things without fruition, thus power and not deed. 10. Wherefore as power is the origin of all acts, so avarice is the root of all affections. 11. Avarice therefore is of the body, because of the imagination alone, and nothing more; it loves wealth not for the sake of a superior use but for the sake of the power to flatter its own loves, which are many.

545. *Still more superior is the love of ourselves, whence is ambition.* 1. This pertains to the superior part of man. 2. It is our proprium which is of the rational mind. 3. Hence whatever descends thence, descends from what is ours. 4. The love of self is the love of one's own power and ability, or that one

may be a perfect and eminent man. 5. It is Adamitic love, in that it recognizes no one superior to oneself; 6. and all companions, or those about one, as below oneself; 7. and society for the sake of oneself, not for the sake of itself. 8. It makes oneself equal to all, who are to be sacrificed for the sake of oneself; 9. thus there is no love of the neighbor, nor of society, nor of God in the love of self. 10. It is the worst because it is proper to man. 11. It is said to be ambition, but it is a filthy ambition. 12. It is a genuine ambition if it be for the end of serving society; therefore one wishes to be greater that he may enjoy the power to do this, but still to condemn oneself. 13. That these three loves are diverse, is evident from the fact that the love of self and one's own glory and fame, altogether destroys the love of the body; it spurns and divulges its avarice. 14. But the latter love or that of the body as avarice destroys all the pleasures which the body will receive from the world. 15. This love is recognized from this, or from its opposite, that it is angry with all who speak against it, and that it agrees with no one except him who flatters. 16. In society where such a love reigns there are perpetual dissensions, nor is reconciliation ever to be hoped for, unless all are submissive to one.

546. *Still more superior is the love of society, which increases through its own degrees according to quality, or the natural, moral and spiritual bond, and according to quantity or universality.* 1. Society is of friends. 2. It is of one or many families. 3. It is of one province where one is known. 4. It is of one kingdom. 5. It is of many kingdoms or of the whole world. 6. Love is circumstance according to quality. 7. The natural bond is of the native country, of parents, of friends, then also of manners and likenesses. 8. The moral bond is of honor and justice. 9. The spiritual bond is of religion.

547. *Still more superior is the love of heavenly society, 1. that is to say, that we love that society because it is the kingdom of God. 2. Thus the spritual bond in this society has respect to that society, 3. because it is also the kingdom of God on earth, and is the seminary of universal society; therefore we must love those who constitute it, 5. thus the society itself.*

6. That this society exists and of what quality it is will be evidently confirmed in our psychological treatises.

548. *The supreme love is the love of God*; 1. because it is love itself, 2. the highest good itself. 3. Thence must we have all that we have; nothing is ours except what we have from Him; 4. from Him is our happiness. 5. But pure love is for the sake of good alone or God, without respect to our happiness, which then in the greatest degree redounds upon us; 6. for love is the very spiritual bond. 7. In no one is there pure love except in God alone.

549. *The remaining conclusions follow of themselves without comment.*

550. *Heavenly society is not for the sake of earthly society*; 1. for the heavenly arises from the earthly as from its seminary, or, if we may argue from ends, it comes to the same. 2. The end for the sake of which the world exists is the animal kingdom.* 3. The end for the sake of which the body exists is the rational mind and the soul; for it is formed for the representation of the soul, and for the image of the operations of the mind. 4. The end for the sake of which man in part exists is society. 5. The end for the sake of which earthly society exists is heavenly society. 6. The end for the sake of which heavenly society exists is the glory of the Divinity. 7. Thus every single inferior thing in itself as in an image and type represents a superior [end].

551. Thus also all intelligence of truth descends. 1. As it is with the good so it is with the true. 2. For truth produces goodness from itself, 3. and goodness contains truth in itself. 4. Thus the one cannot be separated from the other in the first instance; 5. but that from which one flows, from that flows the other. 6. Thus God, as He is goodness itself, so He is truth itself, 7. and is the true good and the good true, which is one; superior goodness and truth flow into inferior, but not the reverse. 8. In inferior things there is no goodness and no truth, which they do not receive from the superior. 9. We receive nothing true and good from the superior, unless we

*This expression clearly seems to signify the soul kingdom, since the adjective *animale* is derived from *anima*, soul or life.—TRANS.

remove impediments and inferior loves; 10. then it inflows from grace, not from our merit. 11. For neither can we remove those things with a superior power, that is to say, it must be by its equilibration, and therefore by its presence; then by contingents which promote or impede, wherefore by providence; 12. therefore there is nothing that is not from grace. 13. You will see these things confirmed, yea, demonstrated, in our psychological treatises: I would dare to say demonstrated, for I know how to demonstrate to the very faith even of those who are now unbelievers.

Continuation from harmonic or musical rules.

552. *1. Deepness and sharpness in sounds are produced from four causes:* 1. From the length of the string or chord; 2. from its tension or slackness; 3. from thickness and multiplication; 4. from its solidity and the specific gravity thence arising. See the experiments in our collections on harmony or music. 5. Whether it be in strings or in membranes, it is the same thing.

553. *All these things present themselves in the ear, and indeed with infinite variety.* 1. Length in the scala cochleae, where it decreases with every dimension; indeed the membrane itself and its hard bony part [presents this]; 2. the tension and slackness is effected by means of the nerves, and by the continuation of the scala from the vestibule; it is very sensible in inflammation of the ear, which is inflammation of the nerves; thus it seems to be effected by the smallest arteries. 3. In respect to thickness, it is similarly presented in that membrane of the cochlea and in the os lamellatum to every dimension; 4. likewise gravity, for there is a bony substance into which the membrane, as it were, thickens. 5. Wherefore no variety from indefinite things can happen, which does not there find its own consonant or concord. 6. It is exactly the same, whether it be in strings or in membranes; whether in diameter or in area, there is a like ratio, although multiplied by one another, and as it seems doubled, for it consists of strings or nerves: thus whether in a drum or a stringed instrument. 7.

Thus it [sound] passes into the nerves according to every composition of differences.

554. *A like ratio obtains in things simultaneous or consonant as in things successive or concordant.* 1. This is a general rule, 2. in art and in nature; 3. see the experiments. 4. Then again that consonant moves consonant; 5. as in strings and instruments, and organs of sound; 6. in us and in the cranium; 7. in the voice and in glasses, etc. 8. See the experiments.

555. *2. Modifications and sounds have between their intervals a concordance according to the coincidence of their vibrations, and thus an application of one sound to the other.* 1. Thus in every modification. 2. More rules occur here, especially in subtler nature than can be treated of scientifically by rules. 3. But let us stick to musical harmonies. 4. [The interval] 1 to 2 gives a like consonance but deeper; thence is the octave; there is only one apposition, which immediately returns to a concord or coincides. 5. But [the interval] 2 to 3 is the fifth; in every third turn it returns to the consonance; 6 [the interval] 3 to 4 returns in every fourth turn, and so forth. 7. There are modes which never coincide, they are called surds; 8. and there are those which coincide after a long series.

556. *It makes a grateful variety, when there are oppositions which quickly and truly coincide.* 1. Hence the gratefulness can be determined by the harmony; 2. as in taste, the sweetly acid, the citraneous, etc. 3. In smell, a spirit is grateful if it be pungent. 4. In music where similar things coincide into harmony, as into chromatics. 5. In colors, the beautiful mingling of blacks and whites; in images, shade and light. 6. In common life, small infirmities, adversities, in hope, in single things. 7. In imagination and thought, the alternation of what is good and evil, what true and false. 7a. Therefore every variety delights. 8. Indeed the opposite gives relation, relation the sense of what is lovely or unlovely. 9. Without relatives there is no affection; one tone affects nothing, except relatively to another. 10. In the form of variety is all beauty and delight. 11. Yea, from subjects decorously co-ordinated and subordinated is society; such must be the heavenly society; where there will be the relation of love and hate in minds.

557. *All the modifications of one sense, of whatever interval they may be, run through the fibres of the nerves within the same moment of time, or with a like velocity.* 1. Otherwise there would not be what is simultaneous or consonant in the brain, which consonance is in the sensory, as in the ear and the eye. 2. They must concord in the flow and communication. 3. *One simple modification consists of infinite smaller ones; it is, as it were, a number, not a unit, but of various units homogeneous among themselves.* 4. Indeed a general constituted of these [units], which general is of an inferior degree, or a composition of many fibres in their own common tunic of convolutions also flashes in the same time. 5. Wherefore compound fibres are in fascicles, 6. and the fascicles are conjoined with their fibres by membranes and fibres, and again are also protracted into a right line and thus compounded; so that they necessarily coincide, nor may one run ahead of the other, 7. but shall be so consonant, as if the one had arisen from the other, which is also the case. 8. *Therefore also the general modification runs through in the same time as the particular modifications.*

558. 3. *The sensory fibres, as also the other fibres, are so connected, that the connection may be hurt by the least movement of disharmony, and the fibres thus become dissonant in the brain.* 1. The fibres in themselves or in their tunics are thus connected; they are made for the harmony of their own fluxion. 2. The fibres communicate with one another through very thin webs of the membranes. 3. The fibres communicate with their common tunics likewise by unfoldings tender and subtil; 4. likewise the membranes, which consist of fibres and vessels. 5. In them are inclosed liquids or lymphs; or it may be the spirit or the blood; these suffer and resist if in case of disharmony; for they are tormented. 6. Every such disharmony reflects into every interfluent part, which is the most perfect form; therefore it is thought to undergo a like change of form, or of its state; 7. not to speak of the organic beginnings in the brain, of which below. 8. Therefore every disharmony threatens the dissolution, disruption, perversion of the state, sickness and death; therefore it sounds so sad; for the menace of death is in those disharmonies.

from B to C, and thus concurs with F.D. 9. It appears that they also always flow parallel ; 10. then also that the triangle of the one is equal to the side of the other, or $AE + EF$ is equal to AB, etc. 10a. So also it is in circles and spirals.

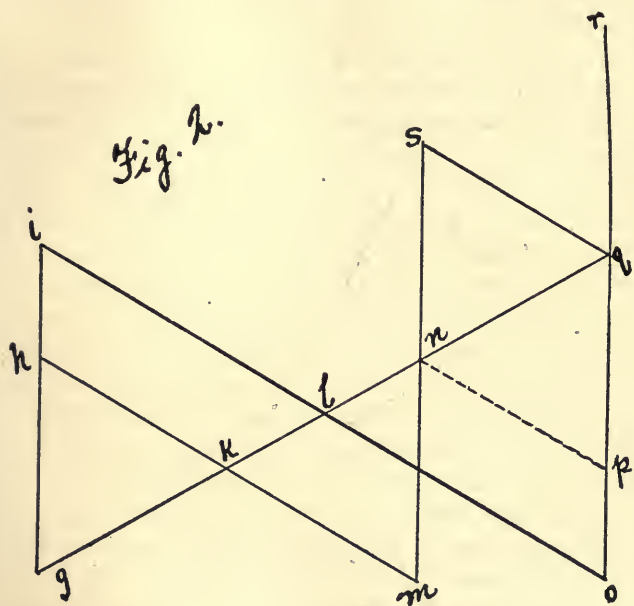
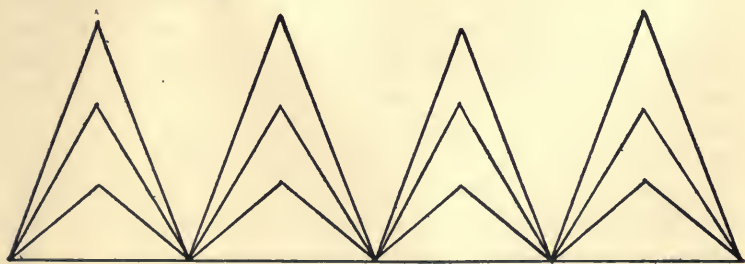


Fig. 3.



562. Fig. II represents the fifth or the ratio of 2 to 3; for 1, gq is divided into two parts at 1, 2. thence arise two triangles gil and loq . 3. The same line is divided into three parts as gk ,

kn, nq. 4. There they also become triangles, or circles, or spirals, which represent modes; 5. whence it appears that the grave or 2 runs through gil at the same time as the sharp gkm runs through 1 $\frac{1}{2}$ triangle. 6. Therefore while it runs through kh it is grave in the ascent, and it is only with km in the descent, but not for long.

563. *From these things now follow these general rules.*

1. That the more consonant things are, or the more they concord, the more frequently they coincide in the same time and in the same space, according to the known rule in theoretic music.
2. The more consonant they are or the more they concord, the more and longer they proceed parallel to one another, and thus agree.
3. Then also they coincide in meaning, analogies, ratios and equations; this can be fully illustrated by geometry, if we wish to illustrate particularly, indeed a book might be filled with agreeing examples; for if we know generals and particulars from the rules of the sciences, then we can proceed to infinity, as, for instance, by the reading of Euclid alone, and from the philosophical maxims of one of the ancient philosophers, or of one of the more modern; they are only applications which are endless; but they becloud the mind while it is held in generals.
4. Whence also it can be deduced that the greater the harmony the more quickly does the sharp draw the grave with it into the same modification, which is the reason that generals and particulars cannot differ, for the one draws the other with it, and particulars thus form their own general.
5. Indeed that which is purer and more perfect, or prior, excites that which is more compound, more imperfect and posterior into the same modification as itself, thus that it may be coincidental.
6. Wherefore that the form of the fluxion purer or prior thus and not otherwise concurs with the form of the fluxion posterior or more imperfect, that it to say, the triangular with the circular, the circular with the spiral, and so forth;
7. for thus the one form becomes the measure and origin of the other. And in one nerve many forms agree, for the one is generated from the other by coincidence.
8. Thus the modification of a nerve produces a general vibration of it;
9. whether such a vibration be into perpetual gyres, or there be

a conatus into the same gyres, and the conatus runs through the fibres, which conatus is then said to be active, or without a vibration of the fibres, but with only a pressure of the conatus, a similar effect results. 9 [a]. These are the primary rules, but there are infinitely more, which are treated of everywhere in the doctrine of forms and modifications. 11. It must be observed that the graver a tone is, the higher it ascends to its general, for it produces higher vibrations; for the more fibres, or units, it moves, at the same time, with the greater difficulty can it concord; wherefore a harmony does not exceed $6/5$, nor does it pass over to the seventh, 11 [a]. then also that particulars must form their own general, as was shown above. 12. That there are many compounds, thus, as it were, series of modifications. 13. That fibers are to be considered as inclosed in their own general, as in centres, so that a modification may tend hither and thither, not to one side but from centre to peripheries, and be terminated in their own general. 14. That one general can receive into itself all series of vibrations of the parts, so that it can be varied, thus the fascicle of all the fibers, few or many; the one rules the other, thus like moments in like space; and without the general there is no modification. 15. As fibres are of a purer form, the more perfect they are, and the less are they reduced to dissonances, and being collected, the more easily are they led back to consonances; they derive their nature from the perfection of their form.

564. *The quantities of sounds express affections*, [1]. so that qualities express sensations. 2. Thus qualities or gravities of sounds also express an acuter harmony, which indeed excites affection, 3. but more naturally and easily if the harmony is conjoined with an analogy of quantity. 4. Quantities are altitudes, as in figure 3, where triple altitudes are represented, as appears from nerves strongly moved; these are traversed also in the same time, whether the sounds be intense or slight. 5. It is just the same whether the form be represented as triangular or circular or spiral, for the ratio of the one refers to the other in these things. 6. There is also a ratio and harmony of altitudes. By the ancients modes are also attributed to those altitudes, but they are differences of one mode. 7. There is a

simple harmony of them, together with a double harmony of qualities; 8. and indeed almost a similar harmony, 9. for while they are dissonant, the degrees then likewise draw the connection of the fibers apart into latitude; 10. as while it descends from grave alto to the sharp thin; it is otherwise if from the thin alto to the grave. 11. This is by musicians called thesis and arsis. 12. The ratio can easily be examined from geometry and from the connection of the fibers. 13. A rectilinear triangle or a circle is the measure of the rest. The higher of these are changed to an acute ellipse, and the less high to a plainer ellipse. 14. But the degrees of attitude are learned from use, for it is difficult to determine whether the quantity be double, triple, sextuple, etc. Hearing does not distinguish as to degrees, so as to be able to give names to them. 15. It is nevertheless evident that there is one measure of many, to which they have respect; 16. and that the measure is double when the triangle becomes of a double area, or the cube of a triple area, and so forth, to the extent that it may not be measured perpendicularly. 17. The limit of altitude is given naturally from nature, if beyond that the connections are broken, and they are so dulled that they can hardly be restored. 18. But since these are degrees of quantity, thence is its quality, the rules are similar.

565. *Changes of state in the brain, but especially in the cortical substance are similarly circumstanced.* 1. For to the modifications in the fibers correspond like changes in the brains or in the cortical substances. 2. For the fibers are, as it were, so many axes, which terminate in those substances, or go forth from those substances, but not as their diameters. 3. Every fiber unfolds itself in the cortical substance, according to the continuation of its fiber, 4. and because all the fibers are modified in sensation, hence similar modifications traverse the fibers in the cortical substances, even to their ends. 5. In those substances fibers run out by a right line in the axis into the surface along all their determinations, wherefore from all the fibers of the axis into all the corresponding fibers of the cortical substances. 6. The fibers of the cortical substance flow forth altogether according to the nature of the fluxion of that

modification; 7. just as the modifications in the atmospheres are determined or formed according to every nature of modification, 8. with this sole difference, that they are connected into a form and thus cohere, so that they are contiguous; it is otherwise in the atmospheres, where they do not cohere but are continuous.* 9. Nevertheless on both sides there is a similar form of modification, 10. which is the reason why modifications in the atmospheres agree so wonderfully with the modifications or sensations in the common sensory.

566. *From these things it follows that in the cortical substances rules come to be observed similar to those in the modifications of the corresponding atmospheres.* 1. Wherefore they spring from these. 2. Similar impressions of those rules in the sensories, exist in the hearing; 3. and they are only the changes of state which sensations produce.

567. *It follows from these considerations that changes of state in the substances of the brain, observe the same harmonic laws as the fibers, about which we have treated, that is to say:* 1. There are things which concord and are consonant, and those which discord. 2. For like changes traverse every single fibre in the substance of the cortex, according to its determination, thus according to its form which all the changes determine at once; 3. thus because they are coherent; if they be not coherent, as in the nerve fibers, in mode in like times, they hurt and distract still more. 4. For many points are there coherent, and indeed in an expanded form, and in its own fluxion, from which they cannot be disturbed without a sense of pain.

568. *According to the rules concerning the atmospheres it follows,* 1. That a modified volume of the atmosphere, while it is modified in every direction, finally ends in unity itself, so that in every unit it terminates its own modification. 2. If the ratio or form of modification be harmonic, then it acts agreeably upon its own single unit; 3. the units therein in the cortical substance of which they are disposed, are like the substances themselves in the brain; wherefore every modification of the brain ends in every cortical substance, as in its own

*The Latin here is *contigua* (contiguous).—Tr.

unit. 4. This modification thus concentrated in the units produces such effect, that it may change the general form or figure of every unit, but not the form of the singulars, which flow within. 5. All single forms make their own general form most suitable to themselves, which corresponds indeed to their own flexion, or the form determines its own figure or external form. 6. If now an exterior modification flow according to fibers to the single parts as units, it follows thence, that they act upon the general forms of the units or without, discordantly; 7. in a word, that they change their general forms and turn them into another form, 8. so that if they were of a circular form, then by concourse they are forced into forms variously elliptical; 9. but indeed if the modification be discordant they are forced into forms perversely illiptical, of no rule, twisted, variously unequal. 10. Thence the interior forms of every unit are actuated, nor can they run forth into a form agreeable to their own nature; 11. but perpetual collisions and combats arise. 12. Thus innumerable other determinations, and many contrary ones, arise so long as this form and general action lasts. 13. If the general form lasts a long time, finally interior determinations are formed according to it, and indeed so that they confirm that form, for determinations are successively thus formed. 14. Thence arise perverse states even to inmost things which conspire. 15. But in the beginning there is combat between modifications or changes, exterior and interior. 16. Victory is treated of. 17. If the exterior conquers, then the state of the interiors is perverted; 18. if the interior conquers, it then wins just as many triumphs, and as it were modifies and extinguishes exterior states; and declares its own freedom.

(To be continued.)

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TO

THE NEW PHILOSOPHY

VOLUMES I-XIII

1898-1910



THE SWEDENBORG SCIENTIFIC ASSOCIATION,

PHILADELPHIA,

1911

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